



Reporting Requirements **Reporting Requirements for Nuclear Power Plants**

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Reporting Requirements for Nuclear Power Plants

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Preface

This regulatory document is part of the CNSC's reporting requirements series of regulatory documents, which also covers reporting requirements for facilities such as uranium mines and mills or other nuclear facilities. The full list of regulatory document series is included at the end of this document and can also be found on the CNSC's website at nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents

Regulatory document REGDOC-3.1.1, *Reporting Requirements for Nuclear Power Plants*, sets out the timing and information that nuclear power plant licensees are required to report to the CNSC to support the conditions of applicable power reactor operating licences (PROL). This document presents the types of reports, their frequency and the applicable timeframe for reporting.

This document also contains guidance, explanatory information, forms and templates to assist users in meeting reporting requirements. Additional forms and data sheets can be found on the CNSC website at nuclearsafety.gc.ca

This document replaces S-99, *Reporting Requirements for Operating Nuclear Power Plants*, published in March 2003.

This document is part of a suite of regulatory documents providing for situation or event and routine compliance monitoring reporting, and the public information and disclosure program for nuclear facilities.

Key principles and elements used in developing this document are consistent with national and international standards.

Important note: Where referenced in a licence either directly or indirectly (such as through licensee-referenced documents), this document is part of the licensing basis for a regulated facility or activity.

The licensing basis sets the boundary conditions for acceptable performance at a regulated facility or activity, and establishes the basis for the CNSC's compliance program for that regulated facility or activity.

Where this document is part of the licensing basis, the word "shall" is used to express a requirement to be satisfied by the licensee or licence applicant. "Should" is used to express guidance or that which is advised. "May" is used to express an option or that which is advised or permissible within the limits of this regulatory document. "Can" is used to express possibility or capability.

Nothing contained in this document is to be construed as relieving any licensee from any other pertinent requirements. It is the licensee's responsibility to identify and comply with all applicable regulations and licence conditions.

Table of Contents

1.	Introduction.....	1
1.1	Purpose	1
1.2	Scope.....	1
1.3	Relevant legislation.....	1
2.	Reporting Requirements	3
3.	Scheduled Reporting.....	4
3.1	Quarterly report on safety performance indicators	5
3.2	Quarterly report on nuclear power plant pressure boundaries	5
3.3	Quarterly report on nuclear power plant personnel	5
3.4	Quarterly report on operational security	6
3.5	Annual report on environmental protection	7
3.6	Annual report on research and development.....	7
3.7	Annual report on risk and reliability	8
3.8	Annual report on fuel monitoring and inspection	8
4.	Other Scheduled Specific Periodic Reports.....	8
4.1	Updates to facility descriptions and final safety analysis report.....	8
4.2	Probabilistic safety assessment	8
4.3	Site environmental risk assessment	9
4.4	Station security report.....	9
4.5	Proposed decommissioning plan.....	9
5.	Event Reports and Notifications.....	10
5.1	Contents of the preliminary event reports and immediate notifications	10
5.2	Detailed event reports	11
	Appendix A: Event Reporting, Notifications and Filing of Specific Records	12
	Authorized activities	13
	Management system, human performance, conventional health and safety, financial status	15
	Records	18
	Operating performance	19
	Radiation protection; environmental protection	28
	Security	34

Safeguards and non-proliferation.....	36
Packaging and transport.....	37
Appendix B: Safety Performance Indicators – Specifications and Data Sheets	40
1. Collective radiation exposure	40
2. Personnel contamination events.....	42
3. Unplanned dose / unplanned exposure	44
4. Loose contamination events.....	46
5. Environmental Releases – Radiological	48
6. Spills	50
7. Mispositioning Index	52
8. Number of Unplanned Transients	54
9. Reactivity Management Index	56
10. Unit Capability Factor	58
11. Unplanned Capability Loss Factor.....	60
12. Forced Loss Rate	62
13. Reactor Trip Rate (RTR)	64
14. Corrective Maintenance Backlog.....	66
15. Deficient Maintenance Backlog.....	68
16. Deferral of Preventive Maintenance	70
17. Safety System Test Performance	72
18. Preventive Maintenance Completion Ratio	74
19. Chemistry Index.....	76
20. Chemistry Compliance Index (non-GSS and GSS)	81
21. Conventional Health and Safety	86
22. Radiological Emergencies Performance Index	89
23. Emergency Response Organization (ERO) drill participation index.....	91
24. Emergency Response Resources Completion Index.....	93
25. Low- and Intermediate-Level Radioactive Solid Waste Generated.....	95
Appendix C: Content Requirements for the Annual Risk and Reliability Report.....	97
C.1 Summary	97
C.2 List of systems important to safety	97
C.3 System performance	97
C.4 Initiating events.....	102

C.5	Supporting data	103
C.6	Report appendices	104
Glossary		106
References.....		113

Reporting Requirements: Nuclear Power Plants

1. Introduction

1.1 Purpose

This regulatory document sets out the requirements and guidance of the Canadian Nuclear Safety Commission (CNSC) for reports, notifications and filing of specific records to the CNSC by licensees of nuclear power plants (NPPs).

Licensees are required to report to the CNSC using event reports for situations or events of higher safety significance and that may require short-term action by the CNSC, and to submit routine scheduled reports on various topics that are required for longer-term compliance monitoring.

Licensees are also required to provide notification of certain normal business activities and to file specific records with the CNSC in accordance with the *Nuclear Safety and Control Act* (NSCA) and the regulations made under the NSCA.

1.2 Scope

This regulatory document incorporates and expands upon requirements found in the NSCA and the regulations made under the NSCA for reporting. "Reporting" means scheduled reports, event reports, notifications and the submission of specific records.

Nothing contained in this document is to be construed as relieving any licensee from any other pertinent requirements. It is the licensee's responsibility to identify and comply with all applicable regulations and licence conditions.

1.3 Relevant legislation

The following provisions of the NSCA and regulations made under the NSCA are relevant to this document:

- pursuant to subsection 24(5) of the NSCA, the CNSC may include in a licence any terms and conditions it considers necessary for the purposes of the NSCA; when incorporated into a licence, this regulatory document requires reporting from the licensee that is in addition to the prescribed reporting requirements found in the NSCA and the regulations made under it
- paragraph 27(b) of the NSCA states that "Every licensee and every prescribed person shall (b) make the prescribed reports and file them in the prescribed manner"; in accordance with section 2 of the NSCA, "prescribed" means prescribed by regulation of the Commission
- section 44 of the NSCA and sections 29, 30 and 31 of the *General Nuclear Safety and Control Regulations* contain provisions where the submission time for full reports can be extended by the terms of a licence condition
- section 45 of the NSCA states that "Every person who, on reasonable grounds, believes that
"(a) "a place or vehicle is contaminated, in excess of the prescribed limit, by a radioactive nuclear substance, or
"(b) an event has occurred that is likely to result in the exposure of persons or the environment to a dose of radiation in excess of the prescribed limits
"shall immediately notify the Commission or an appropriate authority of the location and circumstances of the contamination or event"

- subsection 9(4) of the *General Nuclear Safety and Control Regulations* states that “Every person who carries on an activity without a licence in accordance with subsection [9](1) or [9](2) shall immediately notify the Commission of that fact”
- section 15 of the *General Nuclear Safety and Control Regulations* states that “...every licensee shall notify the Commission of
 - (a) the persons who have authority to act for them in their dealings with the Commission;
 - (b) the names and position titles of the persons who are responsible for the management and control of the licensed activity and the nuclear substance, nuclear facility, prescribed equipment or information encompassed by the licence; and
 - (c) any change in the information referred to in paragraphs (a) and (b), within 15 days after the change occurs”
- subsections 28(1) and (2) of the *General Nuclear Safety and Control Regulations* specify the reporting requirements and procedures for record keeping and disposal as required by the NSCA, the regulations made under the NSCA or the licence, and subsection 28(3) states that “a person who notifies the Commission in accordance with subsection (2) shall file the record, or a copy of the record, with the Commission at its request”
- section 29 of the *General Nuclear Safety and Control Regulations* specifies reporting requirements for general reports; of particular note:
 - paragraph 29(1)(b) requires an immediate “preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to ... the occurrence of an event that is likely to result in the exposure of persons to radiation in excess of the applicable radiation dose limits prescribed by the *Radiation Protection Regulations*”
 - subsection 29(2) requires that “every licensee who becomes aware of a situation referred to in subsection (1) shall file a full report of the situation with the Commission within 21 days ... unless some other period is specified in the licence”
- section 30 of the *General Nuclear Safety and Control Regulations* specifies reporting requirements for safeguards reports
- section 31 of the *General Nuclear Safety and Control Regulations* specifies reporting requirements for deficiencies in records
- section 32 of the *General Nuclear Safety and Control Regulations* states that
 - “(1) every report shall include the name and address of its sender and the date on which it was completed.
 - (2) The date of filing of a report is the date on which it is received by the Commission”
- paragraph 6(2)(c) of the *Radiation Protection Regulations* states that “When a licensee becomes aware that an action level referred to in the licence for the purpose of this subsection has been reached, the licensee shall
 - (c) notify the Commission within the period specified in the licence”
- section 16 of the *Radiation Protection Regulations* states that “when a licensee becomes aware that a dose of radiation received by and committed to a person or an organ or tissue may have exceeded an applicable dose limit prescribed by section 13, 14 or 15, the licensee shall
 - (a) immediately notify the person and the Commission of the dose;
 - (e) within 21 days after becoming aware that the dose limit has been exceeded, report to the Commission the results of the investigation or on the progress that has been made in conducting the investigation”

- subparagraphs 6(k)(ii) and (iii) of the *Class I Nuclear Facilities Regulations* stipulate that licensee shall notify and report information on any accidental or imminent accidental releases to offsite authorities
- subsections 18(3) and 30(2) of the *Nuclear Substances and Radiation Devices Regulations* stipulate situations related to exposure devices or sealed sources that require notification and reporting; in addition, sections 35 and 38 of the same regulations stipulate situations related to nuclear substances and radiation devices that require notification and reporting
- sections 19, 21 and 22 of the *Packaging and Transport of Nuclear Substances Regulations* stipulate the situations for events concerning transportation of nuclear substances and radiation devices that require notification and reporting
- subsection 7.5(4) of the *Nuclear Security Regulations* states that “every licensee shall provide a copy of the written record, together with a statement of actions taken as a result of the [yearly] threat and risk assessment, to the Commission within 60 days after completion of the assessment”; in addition, sections 21 and 36 and subsection 44(2) stipulate the situations for notification for other nuclear security
- section 36(3) of the *Nuclear Security Regulations* states that “every licensee shall notify the Commission in writing of its intention to conduct a security exercise at least 60 days before the exercise date”

2. Reporting Requirements

The following reporting requirements apply to NPPs:

1. the licensee shall manage requirements for reporting, notifications and filing of specific records with the CNSC under this regulatory document in conjunction with other reporting requirements specified in the NSCA, the regulations, and the licence
2. all reports filed by the licensee according to this regulatory document shall contain the name and address of the sender of the report and the date of completion of the report
3. the licensee shall mark all reports made or filed under this regulatory document with an appropriate protection and classification and shall file reports under the appropriate security precautions
4. after determining if a situation or event is reportable, the licensee shall file an event report:
 - a. immediately for a significant situation or event
 - b. within five business days for a non-significant situation or event
5. the licensee shall report on the specific reporting provisions listed in table A.1 of this document
6. the licensee shall use a safety significance classification system as documented in its management system to determine the safety significance of a situation or event
7. an event report that must be submitted immediately may be made orally or filed in writing; an event report made orally shall be followed by a written event report within five business days of the oral event report submission
8. if any required information is missing from an event report, the licensee shall file all of the required missing detailed information within 60 days of filing an original event report for significant situations or events; otherwise, the licensee shall notify the CNSC that an

extension is necessary and provide a date when the missing detailed information will be submitted

9. the licensee shall file scheduled reports with the CNSC at the following frequencies and times:
 - a. quarterly reports are due 90 calendar days after the end of the previous reporting quarter
 - b. annual reports are due on May 1 after the end of the previous calendar year, with the exception of the report on research and development, which is due July 1 after the end of the previous calendar year
10. any extensions to scheduled report due dates require the prior acceptance of the CNSC

Guidance

Table A.1 in appendix A provides a list of situations and events to be reported regardless of their safety significance.

In item 2, the “sender of the report” should always be a designated representative of the licensee.

In item 4a, “immediately” means immediately after the licensee becomes aware of the situation or event and initiates any required response actions, such as alerting the staff of the nuclear power plant, or alerting any municipal or provincial authorities who are responsible for responding to the situation or event.

The licensee should make all reasonable efforts to obtain timely and validated information when filing reports to the CNSC. For event reports in situations or events that have not attained stability and predictability, timeliness shall be prioritized over the availability of data and/or information.

A situation or event that triggers multiple reporting provisions may be amalgamated into a single event report at the discretion of the licensee.

Licensees should use the reporting provisions of table 1 that best correspond to the reported situation(s) or event(s).

If, after further investigation, the licensee believes a situation or event was not reportable, the licensee may provide a written justification to the CNSC.

Licensees should use the situation or event reporting according to this regulatory document as an input to their public disclosure protocol.

3. Scheduled Reporting

Licensees shall submit the following scheduled reports:

- quarterly report on safety performance indicators
- quarterly report on NPP pressure boundaries
- quarterly report on NPP personnel
- quarterly report on operational security
- annual report on environmental protection
- annual report on research and development (R&D)

- annual report on risk and reliability
- annual report on fuel monitoring and inspection

Details on each scheduled report are provided below.

3.1 Quarterly report on safety performance indicators

The safety performance indicator reports shall be submitted on a quarterly basis. It shall be based on the specifications for each safety performance indicator and shall contain the information listed in the data sheet. The specifications and data sheets are provided in appendix B.

3.2 Quarterly report on nuclear power plant pressure boundaries

The NPP pressure boundary report shall be submitted on a quarterly basis. It shall include balance of plant and process systems as part of the list of safety-related systems for the purposes of reporting on pressure boundaries and pressure boundary degradations.

Industry shall use its own specific facility lists to identify all safety-related systems.

The report shall contain the following information:

1. a brief description of any occurrence of a pressure boundary deformation or crack that was not reported under an event report; the description shall include the date of discovery, the magnitude of the deformation or crack, and the associated circumstances, causes and consequences
2. a brief description of any occurrence of a leak in a pressure boundary that was not reported under an event report, where the leak did not exceed any relevant limit specified in a licensing document; the description shall include the date of discovery, the magnitude of the leak, and the associated circumstances, causes and consequences
3. a brief description of the occurrence of any degradation or fault of a pressure relief device that resulted in the pressure-relief device opening during testing at a pressure which lies between its maximum set-point pressure and the hydrostatic test pressure of the associated system; the description shall include the date of discovery of the degradation or fault and the associated circumstances, causes and consequences
4. any supporting information relevant to the descriptions required in items 1, 2 and 3 above

3.3 Quarterly report on nuclear power plant personnel

The report on the performance of NPP personnel shall be submitted on a quarterly basis and shall contain the following information:

1. a list of the names of all persons, certified by the CNSC, who worked at the NPP during the quarter
2. for certified shift workers, the number of shifts worked in the quarter, the reasons for not meeting the minimum shift worked requirements, and a description of any remedial actions being taken
3. the names and dates of any certified person assigned, in excess of six months, to a position that does not require CNSC certification, and the title or description of the temporary position

4. the names and dates of any certified persons whose employment ceased with the licensee's organization during the quarter
5. a list of non-compliances with the limits of hours worked for certified staff performing safety-related tasks or working on safety-related systems at the NPP
6. for the final report of the calendar year:
 - a. a current organizational chart with staffing numbers, and a summary of the organizational changes including responsibilities and reporting relationships made at the NPP management level
 - b. the pass/fail rate on personnel certification examinations
 - c. information that explains the dose data and dose trends, such as: the number of units in operation, outage information (number of outages, duration), scope of activities and other factors that have contributed to the dose results
 - d. the average and maximum individual effective doses for the site (all units combined), including an explanation of what factors contributed to the maximum individual effective dose received
 - e. the number of persons who were monitored for radiation exposure and the number of persons who received a recordable dose (all units combined)

3.4 Quarterly report on operational security

The operational security report shall be submitted on a quarterly basis and shall contain the following information:

1. a brief description of situations or events at the NPP that had or could have had security-related implications or consequences and which were not reported under an event report
2. a summary of the significant results observed from security-related exercises and drills that were carried out at the NPP
3. a description of revisions of security-related emergency procedures
4. where completed, the significant results of the licensee's annual review of the security-related emergency procedures for the NPP, including arrangements with the emergency response force
5. a brief description of the circumstances and causes of failures or impairment of the security structures, systems, components or devices of the NPP, including faults, combinations of faults, situations or events that prevented the security structures, systems, components or devices from meeting their defined specifications and that were not reported under an event report
6. a description of mitigating measures that were not reported under an event report but were taken when security structures, systems, components or devices of the NPP failed to meet their defined specifications
7. a description of any major changes to the security report

3.5 Annual report on environmental protection

The environmental protection report shall be submitted annually and shall contain the following information:

1. a summary of the results of the environmental protection program and an analysis of the significance, with respect to the health and safety of persons and the protection of the environment, of the results of the environmental protection program
2. the amount of nuclear substances (i.e., activity concentrations, flow rates and loadings), in SI units, released to the environment and monitored as part of the licensee's effluent/emission monitoring program, presented on an appropriate basis (weekly or monthly), along with a comparison to regulatory release limits for the nuclear substance
3. the amount of nuclear substances measured in the environment, in SI units, as part of the licensee's radiological environmental monitoring program
4. the results and calculations of the annual radiation doses to the representative persons and/or critical group or groups in comparison to the regulatory public dose limit with a description of the environmental transfer/exposure pathways associated with the operation of the NPP, including the dispersion and dosimetric models used
5. the amount of hazardous substances (i.e., concentrations, flow rates and loadings), in SI units, released to the environment and monitored as part of the licensee's effluent/emission monitoring program, and measured in the environment as part of the licensee's environmental monitoring program
6. for each parameter reported as part of the effluent/emission monitoring and environmental monitoring program, a description of the characteristics of the monitoring results, including but not limited to the sample frequency (e.g., daily, monthly, semi-annually), sample type (e.g., grab, composite, activity counts over time), statistical quantity reported (e.g., weekly/monthly mean, annual average, annual total)
7. a description of any significant events, findings or results, in respect to the conduct of the environmental monitoring program
8. a summary of any proposed changes to the environmental monitoring program

Guidance

If the licensee is required to submit annual reports to other government departments concerning their environmental protection program, including hazardous substances, that show the results of the effluent/emission and environmental monitoring programs, sending a copy of the report to the CNSC is acceptable to satisfy the CNSC's requirement for oversight of the licensee's environmental monitoring program.

3.6 Annual report on research and development

The research and development (R&D) report shall be submitted annually and shall contain the following information:

1. descriptions of R&D activities to resolve safety issues that were completed, underway or planned during the calendar year or are planned for future years
2. the nature of the safety issues to be resolved, progress made over the calendar year to resolve the safety issues, actual or anticipated results of R&D activities, and any unfinished R&D work (i.e., work that remained underway or planned) at the end of the calendar year

3. a description of the links between each of the R&D programs and the operational or safety issues being addressed
4. the schedule, with relevant milestones, for completing R&D activities that were not finished at the end of the calendar year

3.7 Annual report on risk and reliability

The risk and reliability report shall be submitted annually and shall contain the information as outlined in appendix C.

Guidance

For systems important to safety, the licensee may choose to use bounding evaluations for specific impact calculations. The cumulative effect of test deferrals must account for all test deferrals for the system over the year.

3.8 Annual report on fuel monitoring and inspection

The fuel monitoring and inspection report shall be submitted annually and shall include a description of the objectives, elements, procedures, limitations, results and conclusions of the program that the licensee conducted over the calendar year for the purpose of monitoring, inspecting and assessing the condition of the irradiated reactor fuel.

4. Other Scheduled Specific Periodic Reports

Licensees shall submit the following scheduled specific periodic reports:

- updates to facility descriptions and final safety analysis report
- probabilistic safety assessment
- site environmental risk assessment
- station security report
- proposed decommissioning plan

Details on each scheduled specific periodic report are provided below.

4.1 Updates to facility descriptions and final safety analysis report

The licensee shall file an updated facility description and final safety analysis report for the site within five years of the date of the previous submission or when requested to do so by the CNSC.

REGDOC-2.4.1, *Safety Analysis: Deterministic Safety Analysis* [1] provides further requirements regarding updating the facility descriptions and final safety analysis report.

4.2 Probabilistic safety assessment

The licensee shall file an updated probabilistic safety assessment for the site within five years of the date of the previous submission or when requested to do so by the CNSC. The submission shall include:

1. models and analyses that have been appropriately reviewed and revised and that take into account the most up-to-date and relevant information and methods, including the experience gained and lessons learned from the situations, events, problems or other information reported pursuant to this regulatory document (REGDOC-3.1.1)

2. a revision summary sheet highlighting the differences between the existing probabilistic safety assessments referenced in the licensing basis and updated probabilistic safety assessments

Guidance: The revision summary should include:

- a. list of sections with changes in existing models and analyses or any new models or analyses
- b. reasons for updating the models or analysis
- c. summary of changes in major assumptions or reactor operating states
- d. significant changes in results that may affect the conclusions of the probabilistic safety assessment for the design, operational or emergency safety requirements for a particular situation or event

REGDOC-2.4.2, *Safety Analysis: Probabilistic Safety Assessment (PSA) for Nuclear Power Plants* [2] provides further information regarding updating the probabilistic safety assessment.

4.3 Site environmental risk assessment

The licensee shall file an updated environmental risk assessment for the site within five years of the date of the previous submission or when requested to do so by the CNSC.

Guidance

CSA Group's N288.6-12, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* [3] provides further information regarding updating the environmental risk assessment for the site.

4.4 Station security report

The licensee shall file an update of the station security report within five years of the date of the previous submission or when requested by the CNSC. The report shall contain current and updated information required from sections 3 and 16 of the *Nuclear Security Regulations* that reflect changes to the site or nuclear facility.

Guidance

Regulatory document G-274, *Security Programs for Category I or II Nuclear Material or Certain Nuclear Facilities* [4] provides further information.

4.5 Proposed decommissioning plan

The licensee shall file a proposed decommissioning plan within five years of the date of the previous submission or upon the CNSC's request. The proposed decommissioning plan shall contain current and updated information that reflect changes to the site or nuclear facility.

Guidance

CSA Group's N294, *Decommissioning of facilities containing nuclear substances* [5] specifies the requirements for decommissioning plans and provides guidance on decommissioning.

Regulatory document G-219, *Decommissioning Planning for Licensed Activities* [6] provides guidance regarding the preparation of decommissioning plans for activities licensed by the

CNSC. It also provides the basis for calculating the financial guarantees discussed in G-206, *Financial Guarantees for the Decommissioning of Licensed Activities* [7].

5. Event Reports and Notifications

The licensee shall submit event reports and notifications as required by their licensing basis. Table A.1 in appendix A summarizes the requirements from the NSCA, the regulations made under the NSCA, licence conditions and other regulatory documents on timing and reporting of notifications, preliminary event reports, and event reports.

5.1 Contents of the preliminary event reports and immediate notifications

A preliminary event report or an immediate notification shall contain the following information as far as practicable and applicable:

1. date, time and circumstances of the discovery of the situation or event, or notification
2. date and time of the onset (removal, reinstatement) and the duration of the situation or event
3. unique identification reference for the report for record tracking purposes
4. a reporting provision that best describes the situation(s) or event(s)
5. identification of the affected NPP and associated reactor units
6. identification of the affected structures, systems and components, including:
 - a. the design flow diagram reference number(s)
 - b. material type and code classification
 - c. design and hydrostatic test pressure of the system
 - d. magnitude, size or quantification of the degradation or fault (e.g., approximate size, length, depth or leak rates, deviation from set point)
7. description of the occurrence and consequences of the situation or event, including:
 - a. the condition of the site where the situation or event has occurred and the operating conditions, immediately prior, during and after of any power reactor unit involved in the situation or event
 - b. the safety and control functions affected
 - c. causes, circumstances, consequences and effects of the degradation
 - d. a description of any secondary events that occur as a result of the primary reportable event, that may be of regulatory interest
 - e. code, standard or methodology used to assess the significance of the degradation
 - f. a summary of any impairment of a special safety system or safety-related system
 - g. reasons for removal of certified persons
8. identification of persons affected by the situation or event
 - a. including any exposure of a person to radiation
 - b. removal or reinstatement of a certified person from the duties of the position for which the person is certified by the CNSC
 - c. revocation of authorization by the licensee
9. a description of any actions and/or remedial actions the licensee has taken or proposes to take with respect to the situation or event

10. a description of the research or analysis that led to awareness of the problem or potential problem
11. the name of the nuclear or hazardous substance released, the estimated or measured quantity of the unauthorized release, the estimated or measured rate of release, and the manner of release, the offsite monitoring results
12. the municipal, provincial or federal authorities that were notified of the situation or event
13. an indication of when and/or if further information will be submitted for the situation or event to the CNSC
14. for event reports of a contravention of a licence, licensees are to include a description of the nature of the non-compliance with the licence condition

5.2 Detailed event reports

A detailed event report shall contain the following information as far as practicable and applicable:

1. reference to the original event report
2. updates, new or additional information on the content requirements of the event report
3. identification of any further missing information and the date that the missing information will be provided to the CNSC
4. the actions that the licensee has taken or proposes to take, including actions identified and taken to restore the effectiveness of the radiation or environmental protection programs
5. a description of the resulting effects on the health, safety and security of persons and the environment
6. the extent of condition or any review of a comparable situations or events
7. the measures taken to prevent recurrences
8. the effective dose and equivalent dose of radiation received by any person as a result of the situation or event, including the measured or estimated doses to NPP personnel and the public as a consequence of the situation or event
9. a summary of any analysis completed, including the probable cause(s) and conclusions, drawn from the investigation(s) after the situation or event
10. an evaluation of the degree of impairment of special safety systems or of standby safety-related systems
11. an evaluation of any design, operating and or training deficiencies uncovered by the situation or event

Appendix A: Event Reporting, Notifications and Filing of Specific Records

Table A.1 provides a list of the situations and events for which an event report is required, and includes the timing for each event report:

- for non-significant situations or events, the event report is due within five business days of determination of reportability
- for significant situations or events, the event report is due immediately and, if required, shall be updated with additional information in a detailed event report within 60 days
- some exceptions on timing apply to specific situations and events; for example, progress reports or a detailed report are due within 21 days for radiation devices and sealed sources, safeguards, packaging and transport, and for exposures in excess of legal radiation dose limits

Table A.1: Situations and events for which an event report is required, including the timing

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
A.	Authorized activities			
1	Contravention of the NSCA in relation to an activity that is authorized			
	Applicable section(s) of the NSCA or regulations made under the NSCA:			
1a)	<p>NSCA: 27. Every licensee and every prescribed person shall (b) make the prescribed reports and file them in the prescribed manner, including a report on (ii) any contravention of this Act in relation to an activity that is authorized by this Act and any measure that has been taken in respect of the contravention</p> <p>Specific reporting provisions The licensee shall report on: i. a programmatic failure of a program referenced in the licence ii. any contravention of the licence</p> <p>Guidance Regulations made pursuant to the NSCA, orders of the CNSC, a designated officer or an inspector, and licence conditions have their origins from the NSCA. Therefore, it is understood that a contravention of a regulation made pursuant to the NSCA, of an order or of a licence condition is a contravention of the NSCA.</p>		<p>Immediate (significant) or Five business days (non-significant)</p>	60 days (if required)
1b)	<p>General Nuclear Safety and Control Regulations (GNSCR): 9. (4) Every person who carries on an activity without a licence in accordance with subsection (1) or (2) shall immediately notify the Commission of that fact.</p>	Immediate		

2	Transfer or disclosure of prescribed information			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>NSCA:</p> <p>48. Every person commits an offence who</p> <p>(b) discloses prescribed information, except pursuant to the regulations</p> <p>GNSCR:</p> <p>23. (1) No person shall transfer or disclose prescribed information unless the person</p> <p>(a) is legally required to do so, or</p> <p>(b) transfers or discloses it to</p> <p>(i) a minister, employee or other person acting on behalf or under the direction of the Government of Canada, the government of a province or any of their agencies, for the purpose of assisting themselves in exercising a power or performing a duty or function lawfully conferred or imposed on them,</p> <p>(ii) an official of a foreign government or an international agency, for the purpose of meeting obligations imposed by an arrangement made between the Government of Canada and the foreign government or international agency,</p> <p>(iii) a worker, for the purpose of enabling the worker to perform duties assigned by the licensee, or</p> <p>(iv) a person who is legally required or legally authorized to obtain or receive the information.</p>		Immediate	60 days (if required)
3	Notification of authorized delegates and responsible persons			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>GNSCR:</p> <p>15. Every applicant for a licence and every licensee shall notify the Commission of</p> <p>(a) the persons who have authority to act for them in their dealings with the Commission;</p> <p>(b) the names and position titles of the persons who are responsible for the management and control of the licensed activity and the nuclear substance, nuclear facility, prescribed equipment or prescribed information encompassed by the licence; and</p> <p>(c) any change in the information referred to in paragraphs (a) and (b), within 15 days after the change occurs.</p>	Within 15 days		

B.	Management system, human performance, conventional health and safety, financial status			
4	Contingency plan			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>GNSCR:</p> <p>29. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:</p>			
4a)	<p>(d) a situation or event that requires the implementation of a contingency plan in accordance with the licence;</p> <p>Specific reporting provisions</p> <p>The licensee shall report on:</p> <ul style="list-style-type: none"> i. any situation or event (flood, fires, design basis earthquakes ("earthquake"), etc.) that requires the implementation of the nuclear emergency plan, or the use of any abnormal operating procedures or emergency operating procedures, or the mobilization of resources in response to the situation or event ii. the occurrence of any unusual external events (flood, fires, earthquakes, etc.) at or near the site that require further inspection to verify its effect on NPP structures, systems and components iii. the occurrence of any unusual external events at the site that resulted in an operating transient at the NPP <p>Guidance</p> <p>This reporting is in response to an unexpected occurrence that creates a hazard to the safe operation of the NPP, or to the health, safety and security of persons and the environment.</p>		<p>Immediate (significant) or Five business days (non-significant)</p>	<p>60 days (if required)</p>

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
4b)	<p>(g) an actual, threatened or planned work disruption by workers;</p> <p>Guidance The licensee should report:</p> <ul style="list-style-type: none"> any actual, impending, planned or threatened work disruption, including a slowdown, walkout or strike, or another action such as a civil demonstration, that could affect the safety or security of operations at the facility or the capability of the licensee to maintain the staffing levels required by the licensee situations involving the possibility of a strike are considered to be reportable when a union that operates at the facility is in a legal strike position, regardless of whether any actual strike activity has taken place 		<p>Immediate (significant)</p> <p>or</p> <p>Five business days (non-significant)</p>	60 days (if required)
5	Serious illness, injury or death			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>GNSCR:</p> <p>29. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:</p> <p>(h) a serious illness or injury incurred or possibly incurred as a result of the licensed activity;</p> <p>(i) the death of any person at a nuclear facility;</p> <p>Guidance Any death within the exclusion zone or the outer facility site boundary (whichever is larger), regardless of cause, or any death resulting from an injury or illness, regardless of time intervening between injury or illness and death, will be reported.</p>		Immediate	60 days (if required)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
6	Notification of removal or reinstatement of certified personnel			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>NSCA:</p> <p>24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission.</p> <p>Specific reporting provisions</p> <p>The licensee shall submit notification of the following situations:</p> <ul style="list-style-type: none"> a. removal, for cause, of a certified person from the duties of the position for which the person is certified by the CNSC b. reinstatement of a certified person to the duties of the position for which the person is certified by the CNSC 	21 days		
7	Financial status			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>GNSCR:</p> <p>29. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:</p> <p>(j) the occurrence of any of the following events:</p> <ul style="list-style-type: none"> (i) the making of an assignment by or in respect of the licensee under the <i>Bankruptcy and Insolvency Act</i>, (ii) the making of a proposal by or in respect of the licensee under the <i>Bankruptcy and Insolvency Act</i>, (iii) the filing of a notice of intention by the licensee under the <i>Bankruptcy and Insolvency Act</i>, (iv) the filing of a petition for a receiving order against the licensee under the <i>Bankruptcy and Insolvency Act</i>, 		Immediate	60 days (if required)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	<ul style="list-style-type: none"> (v) the enforcement by a secured creditor of a security on all or substantially all of the inventory, accounts receivable or other property of the licensee that was acquired for, or used in relation to, a business carried on by the licensee, (vi) the filing in court by the licensee of an application to propose a compromise or an arrangement with its unsecured creditors or any class of them under section 4 of the <i>Companies' Creditors Arrangement Act</i>, (vii) the filing in court by the licensee of an application to propose a compromise or an arrangement with its secured creditors or any class of them under section 5 of the <i>Companies' Creditors Arrangement Act</i>, (viii) the making of an application for a winding-up order by or in respect of the licensee under the <i>Winding-up and Restructuring Act</i>, (ix) the making of a liquidation, bankruptcy, insolvency, reorganization or like order in respect of the licensee under provincial or foreign legislation, or (x) the making of a liquidation, bankruptcy, insolvency, reorganization or like order in respect of a body corporate that controls the licensee under provincial or foreign legislation. 			
C.	Records			
8	Inaccurate or incomplete records			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>GNSCR:</p> <p>31. (1) Every licensee who becomes aware of an inaccuracy or incompleteness in a record that the licensee is required to keep by the Act, the regulations made under the Act or the licence shall file a report of the inaccuracy or incompleteness with the Commission within 21 days after becoming aware of it, and the report shall contain the following information:</p> <ul style="list-style-type: none"> (a) the details of the inaccuracy or incompleteness; and (b) any action that the licensee has taken or proposes to take with respect to the inaccuracy or incompleteness. <p>(2) Subsection (1) does not apply to a licensee if</p>		<p>Within 21 days</p> <p>Or</p> <p>Not required if GNSCR 31(2)(b) applies</p>	60 days (if required)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	<p>(a) the licence contains a term or condition that requires the licensee to report inaccuracies or incompleteness in a record to the Commission; or</p> <p>(b) the inaccuracy or incompleteness in the record could not reasonably be expected to lead to a situation in which the environment, the health and safety of persons or national security is adversely affected.</p>			
9	Notification and filing of record of disposal of records			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>GNSCR:</p> <p>28. (2) No person shall dispose of a record referred to in the Act, the regulations made under the Act or a licence unless the person</p> <p>(a) is no longer required to keep the record by the Act, the regulations made under the Act or the licence; and</p> <p>(b) has notified the Commission of the date of disposal and of the nature of the record at least 90 days before the date of disposal.</p> <p>(3) A person who notifies the Commission in accordance with subsection (2) shall file the record, or a copy of the record, with the Commission at its request.</p>	At least 90 days before the date of disposal		
D.	Operating performance			
10	Failure, degradation or weakening of structures, systems and components			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>GNSCR:</p> <p>29. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:</p> <p>(f) information that reveals the incipient failure, abnormal degradation or weakening of any component or system at the site of the licensed activity, the failure of which could have a serious adverse effect on the environment or constitutes or is likely to</p>		Immediate (significant)	60 days (if required)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	<p>constitute or contribute to a serious risk to the health and safety of persons or the maintenance of security;</p> <p>Specific reporting provisions</p> <p>For safety-related systems, the licensee shall report on the discovery of:</p> <ol style="list-style-type: none"> ruptures safety-significant deformation or cracks degradations that have the potential to significantly impair the operating ability of the system degradations that cause a leak that exceeds a limit specified in the licensing basis changes in the size, rating or material properties of any part of a pressure boundary that was not allowed for in the design of the boundary local or general reductions in wall thickness beyond that allowed by the applicable pressure vessel code, standard or Act under which the safety-related system's pressure boundary was registered (or could have been registered) degradations of overpressure protection equipment that caused or would have caused the equipment to fail to operate in accordance with the overpressure protection report or another version-controlled document or a licensee document requiring notification of change, other than a relief device that activates above its maximum set point during testing but below the hydrostatic test pressure of the associated system a transient load condition that exceeds a relevant design condition of a pressure boundary or Level B service limits for a nuclear component that has been designed in accordance with Section III, Division 1, Subsection NB of the <i>ASME Boiler & Pressure Vessel Code</i> [8] an analysis related to a pressure boundary of a safety-related system that concludes that an applicable limit specified in the associated design analyses, the design and inspection codes or the design and inspection standards has been exceeded a safety-significant pressure boundary failure or leak in a system that: <ul style="list-style-type: none"> contains radioactive or hazardous substances in high enough concentrations to pose a hazard to unprotected personnel is of sufficient pressure or temperature to pose a hazard to unprotected personnel 			

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	<ul style="list-style-type: none"> – results in a leak of any material that impinges upon any electrical component – results in a leak that causes damage or flooding that affects the safe operation of the plant <p>k. a situation where the configuration of a valve or other device associated with a pressure boundary contravenes relevant requirements in the overpressure protection report or another version-controlled document or a licensee document requiring notification of change</p>			
11	Process systems			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>NSCA:</p> <p>24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission.</p> <p>Specific reporting provisions</p> <p>The licensee shall report on:</p>			
	a. a serious process failure		Immediate	60 days (if required)
	b. a reactor shutdown or an unplanned change in reactor power		<p>Immediate (significant)</p> <p>Or</p> <p>Five business days (non-significant)</p>	60 days (if required)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
12	Safety systems			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>NSCA:</p> <p>24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission.</p> <p>Specific reporting provisions</p> <p>The licensee shall report on situations or events that result in any of the following:</p> <ol style="list-style-type: none"> an actuation – at any power level – of a shutdown system, except where: <ul style="list-style-type: none"> the actuation occurs while the reactor unit is in a guaranteed shutdown state and does not indicate that the shutdown guarantee has failed the actuation was deliberate, as required for testing purposes or as part of a pre-approved shutdown procedure an actuation of an emergency core cooling system or subsystem as a consequence of an initiating parameter exceeding a set point an actuation of a containment system or subsystem as a consequence of an initiating parameter exceeding a set point a degradation of a special safety system or standby safety-related system that prevents the system from performing its safety-related function as intended or from meeting its defined specifications found in the NPP safe operating envelope (SOE) a spurious operation or a spurious failure of a device at the final point of control for the purpose of separating the circuits of the heat transport system from the emergency core cooling systems 		<p>Immediate (significant)</p> <p>Or</p> <p>Five business days (non-significant)</p>	60 days (if required)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
13	Reactor, turbine and generator control			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>NSCA:</p> <p>24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission.</p> <p>Specific reporting provisions</p> <p>The licensee shall report on a reduction below defined specifications found in the NPP safe operating envelope (SOE) of a system for:</p> <ul style="list-style-type: none"> a. controlling reactor power b. controlling the pressure or inventory of the primary heat transport system c. protecting the turbine / generator 		<p>Immediate (significant)</p> <p>Or</p> <p>Five business days (non-significant)</p>	60 days (if required)
14	Hazards			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>NSCA:</p> <p>24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission.</p> <p>Specific reporting provisions</p> <p>The licensee shall report on any of the following situations or events arising from operating experience, research, new or revised safety analysis, that reveals a hazard to the health and safety of persons, security or the environment that may be (or is determined to be) different in nature, greater in probability or magnitude than was previously represented to the CNSC:</p>			
	<ul style="list-style-type: none"> a. Any of the following: <ul style="list-style-type: none"> i. any special safety system that does not meet its defined specifications 		Immediate (significant)	60 days (if required)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	<ul style="list-style-type: none"> ii. a reactor that is operating in a state that was not considered in the safety analysis iii. occurrence of a situation or event of a type that was not considered in the safety analysis iv. unexplained or unexpected behaviour of a reactor core v. an event where two or more systems or components that were assumed in the safety analysis to be mutually independent are, in fact, interdependent vi. any mistake in a version-controlled document or a licensee document requiring notification of change that, if relied or acted upon, would increase the risk to the health and safety of persons, security or the environment vii. release of a nuclear substance in a quantity or rate greater than predicted in the safety analysis viii. determination that actual field configuration is not consistent with assumptions made in the safety analysis ix. the discovery of any item that calls into question the critical characteristics of components and/or the defined specifications of a special safety system, a safety-related system or a security system x. discovery of any documentation that renders inaccurate or suspect the information used to establish continued operation of a component or a system important to safety 		<p>Or</p> <p>Five business days (non-significant)</p>	
	<p>b. discovery of a problem or potential problem from operating experience, research, new or revised safety analysis, that represents a hazard or potential hazard to the health and safety of persons, security or the environment, or that may be different, greater in probability or magnitude than previously represented to the CNSC in the licensing basis including:</p> <ul style="list-style-type: none"> i. a final safety analysis report containing an assumption, input, analytical method or safety analysis result that is or may be invalid ii. a limit, defined in the NPP version-controlled documents or licensee documents requiring notification of change (or in appendices to these documents) that is or may be inadequate to assure safety 			21 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	<ul style="list-style-type: none"> iii. an analysis, from which a limit in a version-controlled document or a licensee document requiring notification of change was derived, that may be invalid or uncertain such that the margin of safety may be less than predicted iv. defined specification of a special safety system or of a safety-related system of an NPP are or may be invalid v. an NPP version-controlled document or licensee document requiring notification of change contains an error that, if accepted, relied or acted upon as being valid, could give rise to increased risks to the health and safety of persons, security or the environment vi. measures in place for the purpose of protecting the environment from the operating impacts of an NPP are or may be inadequate vii. the discovery of a degradation mechanism or component condition that changes or renders inaccurate the submission made to CNSC staff in support of continued operation of a component or system important to safety 			
15	Counterfeit, fraudulent or suspect items			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>NSCA:</p> <p>24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission.</p> <p>Specific reporting provisions</p> <p>The licensee shall report on the discovery of counterfeit, fraudulent or suspect items during the conduct of licensed activities.</p>		<p>Immediate (significant)</p> <p>Or</p> <p>Five business days (non-significant)</p>	60 days (if required)
16	Outages			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>NSCA:</p> <p>24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a</p>			

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	financial guarantee in a form that is acceptable to the Commission. Specific reporting provisions The licensee shall submit:			
	<p>a. a notification of regulatory undertakings (NoRU) that identifies all regulatory undertakings to be completed during the outage. The NoRU should also identify planned work that, in the licensee's judgment, is of regulatory interest</p> <p>Guidance Email notification is acceptable.</p> <p>In this context, "regulatory undertakings" refers to outage work that is required by a code or a standard that is referenced in the PROL (mandatory work) or work that was committed by the licensee to the CNSC through formal correspondence (committed work), including:</p> <ul style="list-style-type: none"> • periodic inspection program (PIP) inspections in the last outage of a PIP cycle • PIP work that is required to allow the extension of an existing disposition that will expire before the next planned outage <p>Also in this context, "planned work" is major safety-significant work that is scheduled in the outage, that in the licensee's judgment is of regulatory interest, but is not mandatory or committed, including:</p> <ul style="list-style-type: none"> • repair or maintenance tasks to correct known problems, e.g., level 3 impairments • inspection tasks (e.g., PIP inspections) that must be completed over a multi-year cycle and for which there is another planned maintenance outage before the end of the current cycle • requests from CNSC staff to do additional inspections beyond the PIP requirements • additions to outage scope, such as component repairs or replacement resulting from conducting a planned inspection during the outage 	60 days prior to the outage		
	b. a notification of any changes to the regulatory undertakings and commitments stated in the NoRU	Five business days		

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	c. an outage completion assurance statement (OCAS) confirming that all regulatory undertakings were successfully completed during the outage <ul style="list-style-type: none"> the OCAS shall include any conditions that the licensee imposed upon reactor restart and/or subsequent operation to ensure the continued safe operation of the nuclear facility the OCAS should include the status of planned work that was identified in the notification of regulatory undertakings (NoRU) 	30 days after the outage		
17	Missed regulatory predefines (scheduled plant activities)			
	Applicable section(s) of the NSCA or regulations made under the NSCA: NSCA: 24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission. Specific reporting provisions The licensee shall report on any failure to perform a test that is required by a licence condition, including any routine test of a safety-related system that is required by a licensing document that has not been deferred in accordance with procedures that are permitted by the licence.		Five days	60 days (if required)
18	Other reportable situations and events			
	Applicable section(s) of the NSCA or regulations made under the NSCA: NSCA: 24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission. Specific reporting provisions The licensee shall report on all other situations or events that are not otherwise specified in this document but can be reasonably assumed to be of regulatory interest, including		Immediate (significant) Or Five business days (non-significant)	60 days (if required)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	<p>notifications and situation or event reports to other regulatory agencies within the scope covered by the objects of the Commission (see section 9 of the NSCA).</p> <p>Guidance</p> <p>The licensee may submit copies of the report(s) or notification(s) prepared for other governing regulatory bodies to the CNSC in accordance with established communication protocols.</p>			
E.	Radiation protection; environmental protection			
19	Misuse of anything intended to protect the health and safety of persons or the environment			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>NSCA:</p> <p>48. Every person commits an offence who</p> <p>(a) alters, otherwise than pursuant to the regulations or a licence, or misuses any thing the purpose of which is to</p> <p>(i) protect the environment or the health or safety of persons from any risk associated with the development, production or use of nuclear energy or the possession or use of a nuclear substance, prescribed equipment or prescribed information</p> <p>(k) fails to comply with this Act or any regulation made pursuant to this Act.</p> <p>GNSCR:</p> <p>17. Every worker shall</p> <p>(b) comply with the measures established by the licensee to protect the environment and the health and safety of persons, maintain security, control the levels and doses of radiation, and control releases of radioactive nuclear substances and hazardous substances into the environment</p>		<p>Immediate (significant)</p> <p>or</p> <p>Five business days (non-significant)</p>	<p>60 days (if required)</p>

20	Actual or potential exposure in excess of legal radiation dose limits (worker)			
20a)	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>GNSCR:</p> <p>29. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:</p> <p>(b) the occurrence of an event that is likely to result in the exposure of persons to radiation in excess of the applicable radiation dose limits prescribed by the <i>Radiation Protection Regulations</i></p>		Immediate	Within 21 days
20b)	<p><i>Radiation Protection Regulations (RPR):</i></p> <p>16. When a licensee becomes aware that a dose of radiation received by and committed to a person or an organ or tissue may have exceeded an applicable dose limit prescribed by section 13, 14 or 15, the licensee shall</p> <p>(a) immediately notify the person and the Commission of the dose;</p> <p>(e) within 21 days after becoming aware that the dose limit has been exceeded, report to the Commission the results of the investigation or on the progress that has been made in conducting the investigation.</p>	Immediate		Within 21 days
20c)	<p>NSCA:</p> <p>24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission.</p> <p>Specific reporting provisions</p> <p>The licensee shall report on any event that could have caused a reportable dose of radiation under the <i>Radiation Protection Regulations</i> but did not, due to fortuitous circumstances rather than to approved procedures.</p>	Immediate		Within 21 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
20d)	NSCA: 45. Every person who, on reasonable grounds, believes that (b) an event has occurred that is likely to result in the exposure of persons or the environment to a dose of radiation in excess of the prescribed limits, shall immediately notify the Commission or an appropriate authority of the location and circumstances of the contamination or event.	Immediate		
21	Reaching an action level for the purposes of environmental or radiation protection			
	Applicable section(s) of the NSCA or regulations made under the NSCA: RPR: 6. (2) When a licensee becomes aware that an action level referred to in the licence for the purpose of this subsection has been reached, the licensee shall (c) notify the Commission within the period specified in the licence. NSCA: 24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission. Specific reporting provisions After becoming aware that an action level has been reached, the licensee shall report to the CNSC the results of the investigation or on the progress that has been made in conducting the investigation.	Within the period specified in the licence	Within the period specified in the licence	60 days (if required)

22	Nuclear and hazardous substance release			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>GNSCR:</p> <p>29. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:</p> <p>(c) a release, not authorized by the licence, of a quantity of radioactive nuclear substance into the environment</p> <p>NSCA:</p> <p>24. (5) A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission.</p> <p>Specific reporting provisions</p> <p>The licensee shall report on:</p> <ul style="list-style-type: none"> a. any failure to monitor, control or record the release of a nuclear substance as required by the licence b. any failure to monitor or control the release of a hazardous substance as required by any federal or provincial regulation, or a licence, permit or certificate issued by a municipal, provincial or other federal authority c. any event that has or has the potential to adversely affect the environment <p>Guidance</p> <p>For item b), a failure to collect an individual sample where justified is not considered failure to monitor. For the purpose of event reporting, failure to monitor is more appropriately considered in the context of programmatic failure.</p>		<p>Immediate (significant) or</p> <p>Five business days (non-significant)</p>	<p>60 days (if required)</p>

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
23	Exposure devices and sealed source assemblies			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>Guidance</p> <p>These notifications generally apply to licensees that have combined nuclear substances and radiation devices with the power reactor operating licence (PROL) and/or cobalt-60 production.</p> <p>The licensee may choose to file under this regulatory document (REGDOC-3.1.1) notifications regarding radiation devices and sealed sources.</p>			
23a)	<p><i>Nuclear Substances and Radiation Devices Regulations (NSRDR):</i></p> <p>30. (2) Every licensee who becomes aware of any of the following situations shall notify the Commission immediately of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:</p> <p>(a) the exposure device or the sealed source assembly is lost, stolen or damaged to an extent that could impair its normal use;</p> <p>(b) the exposure device has a radiation dose rate of more than 2 mSv per hour on any part of its surface when the sealed source assembly is in the shielded position;</p> <p>(c) the sealed source assembly is separated from the exposure device when the latter is not being serviced; or</p> <p>(d) the sealed source assembly fails to return to the shielded position inside the exposure device.</p>	Immediate		
23b)	<p>NSRDR:</p> <p>38. (2) Every licensee referred to in subsection (1) or subsection 30(2) who becomes aware of a situation referred to in one of those subsections shall file a full report of the situation with the Commission within 21 days after the day on which the licensee becomes aware of it or within the period specified in the licence, and the report shall contain the following information:</p> <p>(a) a description of the situation, the circumstances and the problem, if any, with the radiation device;</p> <p>(b) the probable cause of the situation;</p>			60 days (if required)

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	<p>(c) the nuclear substance, and if applicable, the brand name, model number and serial number of the radiation device involved;</p> <p>(d) the date, time and location where the situation occurred or, if unknown, the approximate date, time and location, and the date and time of becoming aware of the situation;</p> <p>(e) the actions that the licensee has taken to re-establish normal operations;</p> <p>(f) the actions that the licensee has taken or proposes to take to prevent a recurrence of the situation;</p> <p>(g) if the situation involved an exposure device, the qualifications of the workers, including any trainee, who were involved;</p> <p>(h) the effective dose and equivalent dose – as those terms are defined in subsection 1(1) of the <i>Radiation Protection Regulations</i> – received by any person as a result of the situation; and</p> <p>(i) the effects on the environment, the health and safety of persons and the maintenance of security that have resulted or may result from the situation.</p>			
24	Notification of sealed source leakage of 200 Bq or greater			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>NSRDR:</p> <p>18. (3) Where a licensee, in the course of conducting a leak test on a sealed source or on shielding, detects the leakage of 200 Bq or more of a nuclear substance, the licensee shall</p> <p>(d) immediately after complying with paragraphs (a) to (c), notify the Commission that the leakage has been detected.</p> <p>Guidance</p> <p>These notifications generally apply to licensees that have combined nuclear substances and radiation devices with the power reactor operating licence (PROL) and/or cobalt-60 production.</p> <p>The licensee may choose to file under this regulatory document (REGDOC-3.1.1) notifications regarding radiation devices and sealed sources.</p>	Immediate		

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
25	Filing of a sealed source tracking report			
	CMD05-H32 Guidance These notifications generally apply to licensees that have combined nuclear substances and radiation devices with the power reactor operating licence (PROL) and/or cobalt-60 production. The licensee may choose to file under this regulatory document (REGDOC-3.1.1) notifications regarding radiation devices and sealed sources.	At least seven days before transfer out or export, and within 48 hours of receipt or import		
F.	Security			
26	Theft or loss of nuclear substance, prescribed equipment or prescribed information			
	Applicable section(s) of the NSCA or regulations made under the NSCA: NSCA: 27. Every licensee and every prescribed person shall (b) make the prescribed reports and file them in the prescribed manner, including a report on (i) any theft or loss of a nuclear substance, prescribed equipment or prescribed information that is used in carrying on any activity that is authorized by this Act GNSCR: 29. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it: (a) a situation referred to in paragraph 27(b) of the NSCA		Immediate	60 days (if required)

27	Actual or attempted breach of security or act of sabotage			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>GNSCR:</p> <p>29. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it:</p> <p>(e) an attempted or actual breach of security or an attempted or actual act of sabotage at the site of the licensed activity;</p> <p>Specific reporting provisions</p> <p>The licensee shall report on:</p> <p>a. any attempted or actual breach against electronic systems and/or subsystems critical for safety, security and emergency preparedness of the NPP</p> <p>b. any security incident in the form of:</p> <p>i. a misuse of security-related equipment that may result in a security and/or safety vulnerability</p> <p>ii. the discharge of firearms or the application of use of force options</p> <p>iii. a credible threat made against the NPP</p> <p>Guidance</p> <p>Immediate reporting is required only where a hazard to the health, safety and security of persons and the environment or to the security of the nuclear facility exists.</p>		<p>Immediate (significant)</p> <p>or</p> <p>Five business days (non-significant)</p>	<p>60 days (if required)</p>
28	Filing of security record for threat and risk assessment			
	<p>Applicable section(s) of the NSCA or regulations made under the NSCA:</p> <p>Nuclear Security Regulations (NSR):</p> <p>7.5 (4) Every licensee shall provide a copy of the written [threat and risk assessment] record, together with a statement of actions taken as a result of the threat and risk assessment, to the Commission within 60 days after completion of the assessment.</p>	<p>Within 60 days</p>		

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
29	Notification of revocation of authorization			
	Applicable section(s) of the NSCA or regulations made under the NSCA: NSR: 21. (2) Subject to subsection (3), a licensee shall immediately notify the Commission in writing of any revocation made under subsection (1) and the reasons for it. (3) If a revocation is in respect of an authorization under section 17, a licensee need not inform the Commission of the revocation and the reasons for it unless the revocation was made because there were reasonable grounds to believe that the person to whom the authorization was issued posed or could have posed a risk to the security of the facility.	Immediate		
30	Notification of intent to conduct security exercise			
	Applicable section(s) of the NSCA or regulations made under the NSCA: NSR: 36. (3) Every licensee shall notify the Commission in writing of its intention to conduct a security exercise at least 60 days before the exercise date.	At least 60 days before the exercise date		
G.	Safeguards and non-proliferation			
31	Safeguards			
	Applicable section(s) of the NSCA or regulations made under the NSCA: GNSCR: 30. (1) Every licensee who becomes aware of any of the following situations shall immediately make a preliminary report to the Commission of the situation and of any action that the licensee has taken or proposes to take with respect to it: (a) interference with or an interruption in the operation of safeguards equipment or the alteration, defacement or breakage of a safeguards seal, other than in accordance with the safeguards agreement, the Act, the regulations made under the Act or the licence; and		Immediate	21 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	<p>(b) the theft, loss or sabotage of safeguards equipment or samples collected for the purpose of a safeguards inspection, damage to such equipment or samples, or the illegal use, possession, operation or removal of such equipment or samples.</p> <p>(2) Every licensee who becomes aware of a situation referred to in subsection (1) shall file a full report of the situation with the Commission within 21 days after becoming aware of it, unless some other period is specified in the licence, and the report shall contain the following information:</p> <p>(a) the date, time and location of becoming aware of the situation;</p> <p>(b) a description of the situation and the circumstances;</p> <p>(c) the probable cause of the situation;</p> <p>(d) the adverse effects on the environment, the health and safety of persons and the maintenance of national and international security that have resulted or may result from the situation;</p> <p>(e) the effective dose and equivalent dose of radiation received by any person as a result of the situation; and</p> <p>(f) the actions that the licensee has taken or proposes to take with respect to the situation.</p>			
H.	Packaging and transport			
32	Packaging and transport			
	Applicable section(s) of the NSCA or regulations made under the NSCA:			
32a)	<p><i>Packaging and Transport of Nuclear Substances Regulations (PTNSR):</i></p> <p>19. (1) Every consignor who becomes aware of any of the following dangerous occurrences shall immediately make a preliminary report to the Commission and to the holder, if any, of a licence to import the radioactive material that is involved in the occurrence:</p> <p>(a) a conveyance carrying radioactive material is involved in an accident;</p> <p>(b) a package shows evidence of damage, tampering or leakage of its contents;</p> <p>(c) any failure to comply with the Act, these regulations or any licence or certificate</p>		Immediate	Within 21 days

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
	<p>applicable to a package that may reasonably be expected to lead to a situation in which the environment, the health and safety of persons or national security is adversely affected;</p> <p>(d) radioactive material is lost, stolen or no longer in the control of a person who is required to have control by the Act or the regulations made under the Act;</p> <p>(e) radioactive material has escaped from a containment system, a package or a conveyance during transport;</p> <p>(f) fissile material is outside the confinement system during transport; or</p> <p>(g) the level of non-fixed contamination during transport exceeds the limits specified in paragraphs 508 and 509 of the IAEA Regulations.</p> <p>(2) Every carrier, consignee or holder of a licence to transport the nuclear substance while in transit who becomes aware of any of the dangerous occurrences referred to in subsection (1) shall immediately make a preliminary report to the Commission and to either the consignor or the holder, if any, of a licence to import the radioactive material that is involved in the occurrence.</p> <p>(3) The preliminary reports referred to in subsections (1) and (2) shall include information on the location and circumstances of the dangerous occurrence and on any action that the consignor, carrier or consignee has taken or proposes to take with respect to it.</p> <p>(5) Within 21 days after a dangerous occurrence referred to in subsection (1), the consignor, the carrier, the consignee and the holder of a licence to transport the nuclear substance while in transit shall file a full report with the Commission, and the report shall contain the following information about the occurrence:</p> <p>(a) the date, time and location;</p> <p>(b) the probable cause;</p> <p>(c) the names of the persons involved;</p> <p>(d) the circumstances;</p> <p>(e) the effects on the environment, the health and safety of persons, and national or international security that have resulted or may result;</p> <p>(f) the doses of radiation that any person has received or is likely to have received; and</p> <p>(g) the actions taken by the consignor, the carrier and the consignee.</p>			

No.	Event, notification or filing of specific records with the CNSC	Timing		
		Notification or filing of specific records	Preliminary event reports	Detailed event reports
32b)	PTNSR: 21. (4) Every person who discovers that a package is damaged or that any portion of the fissile material is outside the confinement system shall file a full report of the discovery with the consignor and with the Commission within 21 days after the discovery.		Immediate (as per PTNSR 19(2))	Within 21 days
32c)	PTNSR: 21. (5) Every person who discovers that a package shows evidence of having been tampered with or that any portion of the contents of a package has escaped from the containment system or the package shall immediately make a preliminary report to the Commission and to either the consignor or the holder, if any, of a licence to import the radioactive material that is involved. (6) The preliminary report of a discovery referred to in subsection (5) shall include information on the location and circumstances of the discovery and on any action that the person has taken or proposes to take with respect to it. (7) Every consignor and every holder of a licence to import radioactive material who receives a preliminary report of a discovery referred to in subsection (5) shall file a full report of the discovery with the Commission within 21 days after receiving the preliminary report.		Immediate	Within 21 days
33	Notification of undeliverable consignments			
	Applicable section(s) of the NSCA or regulations made under the NSCA: PTNSR: 22. If a consignment cannot be delivered to the consignee, the carrier shall (a) notify the consignor, the consignee and the Commission;	Immediate		

Appendix B: Safety Performance Indicators – Specifications and Data Sheets

This appendix provides the specifications and a data sheet for each safety performance indicator. The safety performance indicator reports shall be based on these specifications and shall contain the information listed in the data sheets.

1. Collective Radiation Exposure

Purpose:

To indicate the total dose of ionizing radiation received by all individuals working at the nuclear power plant (NPP) and its related facilities.

To monitor the performance in keeping NPP whole-body dose as low as reasonably achievable.

Definitions:

Total dose is the sum of all effective doses (received and committed) assigned to all individuals, including contract staff and visitors, exposed to ionizing radiation at operating stations and associated sites.

Calculations:

Online (in operation) whole-body dose = collective external radiation exposure (mSv) + collective internal radiation exposure (mSv)

Outage whole-body dose = collective external radiation exposure (mSv) + collective internal radiation exposure (mSv)

Notes:

Collective dose is the total dose for the NPP. For multi-unit stations, it includes all units.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Collective Radiation Exposure	
NPP:	
Year:	
Quarter:	
Online (in operation) whole-body dose:	
External dose (mSv)	
Internal dose (mSv)	
Total online (in operation) whole-body dose (mSv)	
Number of workers receiving a non-zero radiation dose	
Number of units operating	
Number of units being rehabilitated	
Days in operation	
Outage whole-body dose from planned outages:	
External dose (mSv)	
Internal dose (mSv)	
Total outage whole-body dose (mSv)	
Number of workers receiving a non-zero radiation dose	
Outage duration (days)	
Total dose:	
Total online and outage external dose (mSv)	
Total online and outage internal dose (mSv)	
Total collective dose (mSv)	
Additional details as required:	
Prepared by:	Date:

2. Personnel Contamination Events

Purpose:

To indicate the total personnel contamination events that occurred at the NPP and its related facilities.

Definitions:

Tier 1 event: > 50,000 cpm on skin, clothing, modesty garments

Tier 2 event: > 5,000 cpm on skin, clothing, modesty garments

Tier 3 event: >= 100 cpm on skin, clothing, modesty garments (not radiation personal protective equipment (RPPE))

Calculations:

Data only.

Notes:

Not applicable.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Personnel Contamination Events	
NPP:	
Unit:	
Year:	
Quarter:	
Tier 1 Personnel contamination events >50,000 cpm on skin, clothing, modesty garments: _____	
Tier 2 Personnel contamination events > 5,000 cpm on skin, clothing, modesty garments: _____	
Tier 3 Personnel contamination events \geq 100 cpm on skin, clothing, modesty garments (not radiation personal protective equipment (RPPE): _____	
Additional details as required:	
Prepared by:	Date:

3. Unplanned Dose / Unplanned Exposure

Purpose:

To indicate the estimated unplanned external whole-body exposure and unplanned internal tritium exposure received at the NPP and its related facilities.

Definitions:

Unplanned external whole-body exposure:

- Tier 1 event: ≥ 2 mSv (200 mrem) above plan
- Tier 2 event: ≥ 1 mSv (100 mrem) above plan
- Tier 3 event: ≥ 0.1 mSv (10 mrem) above plan

Unplanned internal tritium exposure:

- Tier 1 event: Unexpected increase in H-3 ≥ 2 mSv (200 mrem) above plan
- Tier 2 event: Unexpected increase in H-3 ≥ 1 mSv (100 mrem) above plan
- Tier 3 event: Unexpected increase in H-3 ≥ 0.3 mSv (30 mrem) above plan

Calculations:

Data only.

Notes:

Not applicable.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Unplanned Dose / Unplanned Exposure	
NPP:	
Year:	
Quarter:	
Unplanned external whole-body exposure	
Tier 1 event: ≥ 2 mSv (200 mrem) above plan:	_____
Tier 2 event: ≥ 1 mSv (100 mrem) above plan:	_____
Tier 3 event: ≥ 0.1 mSv (10 mrem) above plan:	_____
Unplanned internal tritium exposure	
Tier 1 event: Unexpected increase in H-3 ≥ 2 mSv (200 mrem) above plan:	_____
Tier 2 event: Unexpected increase in H-3 ≥ 1 mSv (100 mrem) above plan:	_____
Tier 3 event: Unexpected increase in H-3 ≥ 0.3 mSv (30 mrem) above plan:	_____
Additional details as required:	
Prepared by:	Date:

4. Loose Contamination Events

Purpose:

To indicate the loose contamination events that occurred at the NPP and its related facilities.

Definition:

Tier 1 event: Loose or fixed contamination $\geq 37 \text{ kBq/m}^2$ in zone 1 or public domain

Tier 2 event: Loose or fixed contamination in unzoned area, zone 1 or public domain, or widespread loose in Zone 2

Tier 3 event: Widespread loose contamination in zone 3 or isolated loose in zone 2

Calculations:

Data only.

Notes:

Not applicable.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Loose Contamination Events	
NPP:	
Year:	
Quarter:	
Tier 1 event: Loose or fixed contamination $\geq 37 \text{ kBq/m}^2$ in zone 1 or public domain: _____	
Tier 2 event: Loose or fixed contamination in unzoned area, zone 1 or public domain, or widespread loose in zone 2: _____	
Tier 3 event: Widespread loose contamination in zone 3 or isolated loose in zone 2: _____	
Additional details as required:	
Prepared by:	Date:

5. Environmental Releases – Radiological

Purpose:

To indicate the airborne carbon-14 releases, airborne tritium releases and waterborne tritium releases at the NPP and its related facilities.

Definitions:

Airborne tritium release is the weekly tritium air emissions released to the environment via monitored pathways from each station.

Airborne noble gas release is the weekly noble gas air emissions released to the environment via monitored pathways from each station.

Airborne iodine-131 release is the weekly iodine-131 air emissions released to the environment via monitored pathways from each station.

Airborne radioactive particulate release is the weekly radioactive particulate air emissions released to the environment via monitored pathways from each station.

Airborne carbon-14 release is the weekly carbon-14 air emissions released to the environment via monitored pathways from each station.

Waterborne tritium release is the monthly tritium liquid effluent released to the environment via monitored pathways from each station.

Waterborne gross beta/gamma release is the monthly beta/gamma liquid effluent released to the environment via monitored pathways from each station.

Waterborne carbon-14 release is the monthly carbon-14 liquid effluent released to the environment via monitored pathways from each station.

Calculations:

Data only.

Notes:

Not applicable.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Environmental Releases – Radiological													
NPP:													
Year:													
Quarter:													
Weekly airborne releases for the quarter (discharges to air): (AL = action limit and DRL = derived release limit)													
	Tritium oxide AL: Bq/week DRL: Bq/year		Elemental tritium AL: Bq/week DRL: Bq/year		Noble gases AL: Bq/week DRL: Bq/year		Radioactive iodine (I-131) AL: Bq/week DRL: Bq/year		Radioactive particulate AL: Bq/week DRL: Bq/year		Carbon-14 AL: Bq/week DRL: Bq/year		
Week	Release (Bq/month)	%DRL (dose, mSv)	Release (Bq/month)	%DRL (dose, mSv)	Release (Bq/month)	%DRL (dose, mSv)	Release (Bq/month)	%DRL (dose, mSv)	Release (Bq/month)	%DRL (dose, mSv)	Release (Bq/month)	%DRL (dose, mSv)	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
Monthly waterborne releases for the quarter (discharges to water): (AL = action limit and DRL = derived release limit)													
	Tritium oxide AL: Bq/month DRL: Bq/year		Gross beta/gamma AL: Bq/month DRL: Bq/year		Carbon-14 AL: Bq/month DRL: Bq/year								
Month	Release (Bq/month)	%DRL (dose in mSv)	Release (Bq/month)	%DRL (dose in mSv)	Release (Bq/month)	%DRL (dose in mSv)							
M1													
M2													
M3													
Total													
Additional details as required:													
Prepared by:				Date:									

6. Spills

Purpose:

To indicate the total Category A, B and C spills that occurred at the NPP and its related facilities.

Definitions:

A Category A/1 spill causes or may cause one or more of the following adverse effects:

- widespread injury or damage to plant or animal life
- harm or material discomfort to any person
- adverse effect on the health of any person
- impairment of the safety of any person

A Category B/2 spill causes or may cause one or more of the following adverse effects:

- localized injury or damage to any animal life
- widespread or long-term interference with the normal conduct of business
- widespread or long-term loss of enjoyment of the normal use of property
- widespread damage to property other than plant or animal life
- damage to property, other than plant or animal life, such that the property cannot be restored, within a reasonable time, to the condition that existed immediately before the discharge occurred

A Category C/3 spill requires reporting to the Ministry of the Environment but is not classified as either very serious (Category A/1) or serious (Category B/2) spill:

- little to no potential for environmental impact

Calculations:

Data only.

Notes:

Not applicable.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Spills	
NPP:	
Year:	
Quarter:	
Category A/1:	_____
Category B/2:	_____
Category C/3:	_____
Additional details as required:	
Prepared by:	Date:

7. Mispositioning Index

Purpose:

The mispositioning index value (MIV) is an aggregate index based on number of mispositioning events and consequential or non-consequential mispositionings.

Definitions:

NC = non-consequential mispositioning = structures, systems and components off baseline condition or when state changed as per instructions has an unexpected result that results in:

- no fluid / energy movement
- fluid / energy movement that has no operational consequence
- no challenge to personnel safety
- no introduction of energy into a work protection (WP) boundary

C = consequential mispositioning = structures, systems and components off baseline condition or when state changed as per instructions has an unexpected result that:

- resulted in fluid or energy movement (or lack of) that has operational consequences
- affected equipment operation (including poised systems)
- introduced energy into a WP boundary
- challenged personnel safety
- caused unplanned radiation exposure

E = Mispositioning event = structures, systems and components off baseline condition or when state changed as per instructions has an unexpected result that:

- caused a transient or would have prevented operation when called to in response to a transient
- caused a safety system actuation or would have prevented a poised or standby system from operating when called
- resulted in an unmonitored release or significant spill/contamination
- resulted in personal injury
- caused damage to safety-related system(s) or process system(s)

Index performance is averaged over a 3-month rolling period. Data is collected on a monthly basis.

Calculations:

$$MIV = 100 - (E \cdot 10) - (C \cdot 5) - (NC \cdot 1)$$

Notes:

Performance flag: high is better

Unit of measure: percentage (three-month rolling average)

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Mispositioning Index			
NPP:			
Year:			
Quarter:			
<p>Mispositioning events (E) = _____</p> <p>Consequential mispositioning (C) = _____</p> <p>Non-consequential mispositioning (NC) = _____</p> <p>Mispositioning index value (MIV) = _____</p> <p>Note : Mispositioning index value (MIV) = $100 - (E \times 10) - (C \times 5) - (NC \times 1)$</p>			
Additional details on E and C events as required:			
Event Identifier Number	Title	Category (E or C)	Date
Additional details as required:			
Prepared by:		Date:	

8. Number of Unplanned Transients

Purpose:

To indicate the number of reactor power transients due to equipment failures or operator errors while the reactor is not in a guaranteed shutdown state (GSS).

Definition:

The unplanned transients are the situations or events that result in a change of reactor operating states due to:

1. unplanned reactor setbacks and stepbacks, both automatic and manual, that occur while the reactor is not in a guaranteed shutdown state. These reactor setbacks and stepbacks are events resulting from internal plant equipment failure, spurious signal, human error or an external event.
2. unplanned reactor trips, both automatic and manual, that occur while the reactor is not in a guaranteed shutdown state. These reactor trips are events resulting from internal plant equipment failure, spurious signal, human error, or an external event.

Calculations:

Total number of unplanned transients in a quarter for a unit.

Total number of hours during which the reactor is either being placed in GSS or is in GSS.

Notes:

The manual reactor trips, setbacks or stepbacks that are required by planned (as opposed to forced) outage maintenance or routine testing are not to be included.

If a situation or event results in a combination of a reactor setback, stepback and/or trip in sequence, then the total number of transients will be counted as one.

If a situation or event results in a reactor trip on both shutdown systems, the number of reactor trips shall only be counted as one.

After a reset of reactor setback, stepback and/or trip by operator and the reactor power is allowed to increase, if another transient occurs because the causes of the initial transient were not corrected, then the subsequent reactor setback, stepback and/or trip shall be included in the calculation of the number of unplanned transients.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Number of Unplanned Transients				
NPP:				
Year:				
Quarter:				
Total hours during which unit _____ was in guaranteed shutdown state for the quarter: _____				
Total hours during which unit _____ was in guaranteed shutdown state for the quarter: _____				
Total hours during which unit _____ was in guaranteed shutdown state for the quarter: _____				
Total hours during which unit _____ was in guaranteed shutdown state for the quarter: _____				
Reactor trips:				
Auto or manual	Affected trip parameter(s)	% full power prior to trip	Event date	Reference
Reactor stepbacks:				
Auto or manual	Affected trip parameter(s)	% full power prior to trip	Event date	Reference
Reactor setbacks:				
Auto or manual	Affected trip parameter(s)	% full power prior to trip	Event date	Reference
Additional details as required:				
Prepared by:			Date:	

9. Reactivity Management Index

Purpose:

The reactivity management index is based on the severity of reactivity management events.

Definition:

RMEC1= significant reactivity management event:

An unplanned or uncontrolled change in reactivity that leads to a significant impact, including operation outside safe operating limits (e.g., as a result of a change in reactor configuration, status or poison concentration, operating policies and principles (OP&P) limits for reactor power exceeded).

RMEC2= reactivity management event:

An unplanned or uncontrolled change in reactivity that leads to an impact, including operation outside administrative (procedural) limits (e.g., as a result of a change in reactor configuration, status or poison concentration).

RMEC3= near miss reactivity management event:

Failure of a barrier, process or procedure for which there was minor or no direct impact on reactivity; however, under different circumstances, the failure could have led to a category 1 or 2 event (e.g., loss of redundancy on a reactivity management related system).

RMEC types:

- | | |
|---------|---|
| Type A: | power and reactivity device control |
| Type B: | fuelling/fuel |
| Type C: | guaranteed shutdown state/criticality control |
| Type D: | safe operating envelope |

Notes:

Event summary:

- include a summary of RMEC1 and RMEC2 events
- this summary shall include a report number, RMEC level, RMEC type, unit, event title and date of occurrence
- e.g., X-2013-123456, RMEC-C2, unit 1, reactor stepback on approach to criticality, ddMONyyyy

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title:	Reactivity Management Index											
NPP:												
Year:												
Quarter:												
Number of events broken out by unit and level:												
	Unit 1			Unit 2			Unit 3			Unit 4		
	RMEC			RMEC			RMEC			RMEC		
	1	2	3	1	2	3	1	2	3	1	2	3
Month 1												
Month 2												
Month 3												
Additional details on RMEC1 and RMEC2 events as required:												
Event Identifier Number	Type / Category 1 and 2	Unit	Title						Date			
Additional details as required:												
Prepared by:							Date:					

10. Unit Capability Factor

Purpose:

To monitor progress in attaining high unit and industry energy production reliability. This indicator reflects effectiveness of plant programs and practices in maximizing available electrical generation, and provides an overall indication of how well plants are operated and maintained.

Definition:

Unit capability factor is defined as the ratio of the available energy generation over a given time period to the reference energy generation over the same time period, expressed as a percentage.

Calculations:

The unit capability factor is determined for each period as shown below:

$$UCF = \frac{(REG - PEL - UEL)}{(REG)} \times 100$$

where:

- UCF = unit capability factor
- REG = reference energy generation for the period
- PEL = total planned energy losses for the period
- UEL = total unplanned energy losses for the period

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Unit Capability Factor	
NPP:	
Unit:	
Year:	
Quarter:	
Reference energy generation (REG) = _____	
Total planned energy losses (PEL) = _____	
Total unplanned energy losses (UEL) = _____	
Unit capability factor (UCF) = _____	
Note: Unit capability factor (UCF) = ((REG - PEL - UEL) / REG) * 100%	
Additional details as required:	
Prepared by:	Date:

11. Unplanned Capability Loss Factor

Purpose:

To monitor industry progress in minimizing outage time and power reductions that result from unplanned equipment failures or other conditions. This indicator reflects the effectiveness of plant programs and practices in maintaining systems available for safe electrical generation.

Definition:

Unplanned capability loss factor is defined as the ratio of the unplanned energy losses during a given period of time, to the reference energy generation, expressed as a percentage.

Unplanned energy loss is energy that was not produced during the period because of unplanned shutdowns, outage extensions, or unplanned load reductions as a result of causes under plant management control. Causes of energy losses are considered to be unplanned if they are not scheduled at least four weeks in advance. Causes considered to be under plant management control are further defined in the clarifying notes.

Reference energy generation (REG) is the energy that could be produced if the unit were operated continuously at full power under reference ambient conditions throughout the period. Reference ambient conditions are environmental conditions representative of the annual mean (or typical) ambient conditions for the unit.

Calculations:

Reference energy generation (REG) = Unit capacity x referenced period (Mw-hrs)

Total unplanned energy loss per quarter (UEL) = Total unplanned energy loss over referenced period (Mw-hrs)

Unplanned capability loss factor (UCL) = $UEL \times 100\% / REG$

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Unplanned Capability Loss Factor	
NPP:	
Unit:	
Year:	
Quarter:	
Reference energy generation (REG) = _____	
Total unplanned energy losses (UEL) = _____	
Unplanned capability loss factor (UCLF) = _____	
Note: Unplanned capability loss factor (UCLF) = (UEL) / REG * 100%	
Licensee to submit a graphical representation of unit power history for the quarter, a brief description of all energy losses (power reduction, duration in hours, reason for the reduction from the reference capacity) and the classification of the energy loss(es) as either unplanned losses, planned losses or losses due to "external" effects.	
Additional details as required:	
Prepared by:	Date:

12. Forced Loss Rate

Purpose:

To monitor industry progress in minimizing outage time and power reductions that result from unplanned equipment failures, human errors, or other conditions during the operating period (excluding planned outages and their possible unplanned extensions). This indicator reflects the effectiveness of plant programs and practices in maintaining systems available for safe electrical generation when the plant is expected to be at the grid dispatcher's disposal.

Definition:

The forced loss rate (FLR) is defined as the ratio of all unplanned forced energy losses during a given period of time to the reference energy generation minus energy generation losses corresponding to planned outages and any unplanned outage extensions of planned outages, during the same period, expressed as a percentage.

Calculations:

The forced loss rate is calculated for a period as shown below.

$$FLR \text{ for a unit (\%)} = \frac{(FEL)}{(REG - (PEL + OEL))} \times 100$$

where:

- FLR = forced loss rate
- FEL = unplanned forced energy losses
- REG = reference energy generation
- PEL = planned energy losses
- OEL = unplanned outage extension energy losses

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Forced Loss Rate	
NPP:	
Unit:	
Year:	
Quarter:	
Reference energy generation (REG) = _____	
Total planned energy losses (PEL) = _____	
Total unplanned forced energy losses (FEL) = _____	
Total unplanned outage extension energy losses (OEL) = _____	
Forced loss rate (FLR) = _____	
Note: Forced Loss Rate (FLR) = $FEL / (REG - (PEL + OEL)) * 100\%$	
Additional details as required:	
Prepared by:	Date:

13. Reactor Trip Rate (RTR)**Purpose:**

To monitor performance of unplanned automatic reactor shutdowns.

To provide an indication of how well a plant is operated and maintained.

Definition:

Unplanned reactor trips (SCRAMS) per 7,000 hours critical

Calculations:

The unit and industry values for this indicator are determined for a period as shown below:

$$RTR = \frac{(total\ unplanned\ automatic\ scrams\ while\ critical) \times 7000}{(total\ number\ of\ hours\ critical)}$$

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Reactor Trip Rate (RTR)	
NPP:	
Unit:	
Year:	
Quarter:	
Total unplanned automatic trips (SCRAMS) while critical = _____	
Total number of hours critical = _____	
Reactor trip rate (RTR) = _____	
Note: Reactor Trip Rate (RTR) = (total unplanned automatic scrams while critical * 7000) / total number of hours critical	
Additional details as required:	
Prepared by:	Date:

14. Corrective Maintenance Backlog

Purpose:

To monitor the effectiveness of the maintenance program at the NPP and its related facilities.

Definition:

Corrective maintenance work is required when a structure, system or component (SSC) has failed and can no longer perform its design function. Corrective maintenance backlog consists of all corrective work generated through work order requests and appears in the work management system as uncompleted work.

Calculations:

The indicator consists of the total number of online corrective maintenance work orders at the end of the quarter which appears as uncompleted work. The corrective maintenance work orders should be reported on two different priorities (critical and noncritical components). The indicator is in the form of work orders per unit.

Notes:

Common service should be treated as a separate unit, such as unit 0.

Outage corrective maintenance work is not included in this indicator.

Performance Indicator Data Sheet**Revision Date: yyyy-mm-dd**

Title: Corrective Maintenance (CM) Backlog				
NPP:				
Year:				
Quarter:				
Corrective critical work backlog:				
Unit __	Unit __	Unit __	Unit __	Unit __
Corrective noncritical work backlog:				
Unit __	Unit __	Unit __	Unit __	Unit __
Additional details as required:				
Prepared by:			Date:	

15. Deficient Maintenance Backlog

Purpose:

To monitor the effectiveness of the maintenance program at the NPP and its related facilities.

Definition:

Deficient maintenance is planned when structures, systems, or components have been identified as degrading but still capable of performing their design function. Deficient maintenance backlog consists of all deficient work generated through work requests and appears in the work management system as uncompleted work.

Calculations:

The indicator consists of the total number of deficient maintenance work orders at the end of the quarter, which appears as uncompleted work. The deficient maintenance work orders should be reported on two different priorities (critical and noncritical components). The indicator is in the form of work orders per unit.

Notes:

Common service should be treated as a separate unit, such as unit 0.

Outage deficient maintenance work is not included in this indicator.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Deficient Maintenance Backlog				
NPP:				
Year:				
Quarter:				
Deficient critical work backlog:				
Unit __	Unit __	Unit __	Unit __	Unit __
Deficient noncritical work backlog:				
Unit __	Unit __	Unit __	Unit __	Unit __
Additional details as required:				
Prepared by:			Date:	

16. Deferral of Preventive Maintenance

Purpose:

To monitor the effectiveness of the maintenance program at the NPP and its related facilities.

Definition:

Deferred preventive maintenance is preventive maintenance that has received an approved technical justification for extension prior to its late date.

Calculations:

The value includes two parts:

- number of deferrals of critical preventive maintenance work orders per unit per quarter
- number of total deferred preventive maintenance work orders per unit per quarter

Notes:

Identification and count is for the primary preventive maintenance tasks only; e.g., do not include secondary tasks such as maintaining scaffolding.

Common service should be treated as a separate unit, such as unit 0.

Performance Indicator Data Sheet**Revision Date: yyyy-mm-dd**

Title: Deferral of Preventive Maintenance				
NPP:				
Year:				
Quarter:				
Number of deferrals of critical preventive maintenance tasks:				
Unit __	Unit __	Unit __	Unit __	Unit __
Total number of deferred preventive maintenance tasks:				
Unit __	Unit __	Unit __	Unit __	Unit __
Additional details as required:				
Prepared by:			Date:	

17. Safety System Test Performance

Purpose:

To indicate successful completion of tests required by licence condition, including those referenced in documents submitted in support of a licence application.

To monitor performance in meeting regulatory and licensee availability requirements.

Definition:

The safety system test (SST) performance is the sum of those tests that are not completed for each of the three groups of safety-related systems (i.e., the special safety systems, the standby safety systems, and other safety-related process systems) in a quarter.

Calculations:

Number of missed tests = $a + b + c$

where:

a = number of missed tests for the special safety systems

b = number of missed tests for the standby safety systems

c = number of missed tests for the safety-related process systems

Notes:

This safety performance indicator was renamed from “number of missed mandatory safety system tests” for improved clarity and application.

For the purpose of this safety performance indicator, the following shall apply:

- special safety systems: shutdown system 1 (SDS1), SDS2 (SDSE for PNGS-A), emergency core cooling (ECC), and containment
- standby safety systems: boiler emergency cooling, emergency power supply, standby generators, emergency filtered air discharge, emergency water, inter-unit feedwater tie
- safety-related process systems: reactor regulating, heat transport, moderator, Class I, II and III, auxiliary boiler feed, service water

This list may be expanded in the future.

Missed tests refer to those not completed, as opposed to those that fail.

Tests conducted beyond the maximum allowable time interval permitted by the reliability calculation or by an applicable engineering code will count as a missed test, unless approval has been obtained from the CNSC to extend the test interval.

For multi-unit stations, station-wide tests shall be reported under unit 0.

For benchmarking, report the total number of tests performed for each category (a, b, and c).

These figures do not include panel check SSTs.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Safety System Test Performance	
NPP:	
Unit:	
Year:	
Quarter:	
Number of missed tests for the special safety systems	a = _____
Total number of special safety system tests (SSTs) performed	a1 = _____
Number of missed tests for the standby safety-related systems	b = _____
Total number of standby safety-related systems tests performed	b1 = _____
Number of missed tests for the safety-related process systems	c = _____
Total number of safety-related process systems tests performed	c1 = _____
Number of missed tests (a + b + c)	= _____
Total number of tests performed (a1 + b1 + c1)	= _____
Note: Some SSTs cover both standby and safety-related system testing in one safety system test. These SSTs have been included in both totals.	
Additional details as required:	
Prepared by:	Date:

18. Preventive Maintenance Completion Ratio

Purpose:

To indicate the fraction of preventive maintenance jobs to total maintenance jobs completed.

To monitor performance in meeting expectations in the area of preventive maintenance.

Definition:

The ratio of preventive maintenance (PM) jobs completed divided by the preventive maintenance plus corrective maintenance (CM) jobs completed for all safety-related systems.

Calculations:

$$PM \text{ Completion (\%)} = \frac{(PM \text{ jobs per quarter})}{(PM \text{ jobs per quarter} + CM \text{ jobs per quarter})} \times 100$$

Notes:

PM jobs are those jobs performed on the safety-related system equipment in the field that is in working order when the job commences. The PM jobs shall include those that are frequency or condition based.

Corrective maintenance jobs are those jobs performed as a result of a reported failure of safety-related system equipment. It shall not include design modifications.

Work orders on safety-related systems are those work orders that are written during the quarter and must have undergone a preliminary review by the NPP work management group and be designated as valid to be included in the count for a quarter.

The data is to be reported by unit, including the common unit for multi-unit NPPs. Jobs are counted by work order issued to each discipline, not on a task basis. A work order that covers repetitive jobs for multiple equipment shall be counted as one work order for each separate piece of equipment.

Common service should be treated as a separate unit, such as unit 0.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Preventive Maintenance Completion Ratio																													
NPP:																													
Year:																													
Quarter:																													
<table border="1" style="width: 100%; border-collapse: collapse; margin-left: auto; margin-right: auto;"> <tr> <td style="width: 50%;"></td> <th colspan="5" style="text-align: center; padding: 5px;">Unit</th> </tr> <tr> <td></td> <th style="width: 10%; text-align: center; padding: 5px;">0</th> <th style="width: 10%; text-align: center; padding: 5px;">1</th> <th style="width: 10%; text-align: center; padding: 5px;">2</th> <th style="width: 10%; text-align: center; padding: 5px;">3</th> <th style="width: 10%; text-align: center; padding: 5px;">4</th> </tr> <tr> <td style="padding: 5px;">(i) Total number of preventive maintenance jobs on safety-related systems completed.</td> <td style="height: 40px;"></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding: 5px;">(ii) Total number of corrective maintenance jobs on safety-related systems completed.</td> <td style="height: 40px;"></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>							Unit						0	1	2	3	4	(i) Total number of preventive maintenance jobs on safety-related systems completed.						(ii) Total number of corrective maintenance jobs on safety-related systems completed.					
	Unit																												
	0	1	2	3	4																								
(i) Total number of preventive maintenance jobs on safety-related systems completed.																													
(ii) Total number of corrective maintenance jobs on safety-related systems completed.																													
<div style="margin-top: 20px;">Total PM work orders completed during the quarter = _____</div> <div style="margin-top: 20px;">Total CM work orders completed during the quarter = _____</div> <div style="margin-top: 20px;">PM completion ratio (%) = _____</div>																													
Additional details as required:																													
Prepared by:			Date:																										

19. Chemistry Index

Purpose:

To indicate long-term unit control of important chemical parameters.

To monitor performance in meeting licensee's requirements in chemistry.

To compare performance between Canadian CANDU units.

Definition:

The average percentage of time that the selected chemical parameters are in specification during the quarter.

Calculations:

$$\text{Chemistry index (\%)} = \frac{\sum_{i=1}^m \frac{a_i}{A}}{m}$$

where:

- a_i = the number of hours that parameter "i" is in specification during the quarter
- A = the number of hours the plant is in an operational state during the quarter, as defined by licensee-specific documentation
- a_i/A = the fraction of time that parameter "i" is in specification during the quarter
- m = the number of parameters monitored during the period, usually the 15 parameters on the list below

$$\sum_{i=1}^m \frac{a_i}{A} = \text{the sum of individual time-in-specification fractions for each parameter monitored in the index}$$

All data is dimensionless. The chemistry index (CI) results will range between 0% and 100%.

Parameters monitored:

Annulus gas:	[O ₂]	Condensate extraction pump:	dissolved O ₂ pH
Feedwater:	dissolved O ₂ total iron total copper hydrazine	Primary heat transport system:	pH _a (calc) dissolved D ₂ chloride fluoride conductivity
Steam generators:	[Cl] [SO ₄ ²⁻] [Na ⁺]		

Note 1:

The Chemistry Index shall be reported as the percentage of time in specification. For each parameter, the index is calculated as follows:

$$\text{time in specification (\%)} = \frac{(\text{hours in specification})}{(\text{total operating hours in period})} \times 100$$

The initiation of an out-of-specification event occurs with the first result measured outside the range of the specification, as indicated in licensee-specific chemistry program documentation.

Termination of the event is achieved only by reducing the control parameter within the specification range. The duration of the out-of-specification condition will be calculated as the time between the first out-of-specification sample and the next measured in-specification sample. The time in specification (%) is then calculated as 100% - S (time of measurement period out-of-specification (%)).

The total operating hours in the period refers to the total operating hours for the system to which the chemical parameter pertains.

Note 2:

Parameters that are included in the indicator but were not measured (because the monitoring capability did not exist or the measurements were not obtained during the period; e.g., an instrument not available) will be reported as being out-of-specification. In cases where the parameter is out-of-specification due to the unavailability of a facility, the parameter shall be reported as being out-of-specification.

When the safety of chemical technicians or employees could be adversely affected by new hazards during normal execution of their tasks, or when the status of the plant is such that the chemical measure is useless or unrepresentative, the representative period will be adjusted without penalty. Such measures will be qualified "void". The data shall be auditable.

It is recognized that in some cases a temporary exemption is granted for measurement of a parameter, or deviation of a specification from the range specified in program documentation. This exemption is to be granted by the chemistry program authority. It is acceptable to indicate "not applicable (N/A)" for the parameter for the specific time period. If the temporary exemption applies for less than one quarter, the time-in-specification for the parameter shall be calculated as the time that the temporary exemption does not apply. Temporary exemptions are intended to be used when instruments or facilities are not available for a significant period of time, where there are temporary modifications to licensee procedures due to new concerns regarding unsafe conditions, or when short duration trials are being carried out. Records pertaining to the temporary exemption shall be auditable.

Whenever the parameter is deemed to be "not applicable (N/A)", a short explanatory note and a reference to the licensee's documentation for any temporary exemption should accompany the submission on these performance indicators.

In cases where the parameter is deemed to be "not applicable (N/A)" for a particular period of time, the number of parameters in the Chemistry Index % equation should be adjusted to reflect the number of parameters actually tracked during the specific quarter.

Note 3:

For systems whose performance is reported only for unit operating conditions – if a parameter is in (or out of) specification before a shutdown, it is considered to remain in (or out of) specification once the system is back in service until it is re-analyzed and found to be otherwise.

Note 4:

Performance must be reported for all Chemistry Index and chemistry compliance index parameters using the specifications documented in the most current revision of the licensee's chemical specifications manual. Performance must be reported for all time periods when the system is considered to be in an operational state, as defined by licensee-specific documents.

Note 5:

The reference chemical specifications and sampling frequency for each parameter shall be as documented in the most current revision of the licensee's chemistry specifications manuals. Any deviations from these reference values for reporting on these performance indicators shall be noted in report submissions. Any changes to the specifications and sampling frequency shall be documented in the chemistry specifications manuals and supporting documentation.

The minimum sampling/monitoring frequency is determined by the licensee's current requirements.

Note 6:

Each station will determine whether results from grab samples or on-line instrument readings will be used to calculate the performance. Online instrument readings are the preferred method if an adequate quality assurance / quality control (QA/QC) program is in place to ensure accuracy.

Where online monitoring equipment is available, the success ratio will be calculated as the ratio of time where the monitoring is online and valid data is available and within range over total time. When monitoring equipment fails, it is permissible to replace the monitoring with manual sampling techniques at a reasonable frequency.

Note 7:

For multi-unit sites, the unit performance is the average of the performance of the individual control parameters. On an operating unit basis:

$$\text{time in specification (\%)} = \frac{\sum (\text{time in specification for index parameters (\%)})}{(\text{number of parameters in the index})}$$

Note 8:

The station result is the time-weighted average of the operating units' Chemistry Index or chemistry compliance index values; this ensures that units which were operating for only part of the period are not given the same weight as those which operated for the whole period.

$$\text{station index} = \frac{\sum (\text{index for each unit} \times \text{operating hours for unit})}{\sum (\text{operating hours for all units})}$$

Note 9:

Performance does not need to be reported for parameters during short duration trials or tests being conducted to optimize chemistry and which affect those parameters.

Note 10:

Parameters making up the list of the index, and the definitions of time-in-specification and voiding, are reviewed by the CNSC.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Chemistry Index					
NPP:					
Year:					
Quarter:					
<p>a_i is the number of hours that parameter "i" is in specification during the quarter</p> <p>A is the number of hours the plant is in an operational state (as defined by licensee-specific documentation) during the quarter</p>					
Parameter		Unit (hours)			
		—	—	—	—
Primary heat transport system pH _a (calc)	a_1				
	A_1				
Primary heat transport system dissolved D ₂	a_2				
	A_2				
Primary heat transport system chloride	a_3				
	A_3				
Primary heat transport system fluoride	a_4				
	A_4				
Primary heat transport system conductivity	a_5				
	A_5				
Annulus gas [O ₂]	a_6				
	A_6				
Steam generators chloride	a_7				
	A_7				
Steam generators sulphate	a_8				
	A_8				
Steam generators sodium	a_9				
	A_9				
Feedwater dissolved O ₂	a_{10}				
	A_{10}				
Feedwater total iron	a_{11}				
	A_{11}				
Continued...					

Parameter	Unit (hours)				
	—	—	—	—	
Feedwater hydrazine	a ₁₃				
	A ₁₃				
Condensate extraction pump dissolved O ₂	a ₁₄				
	A ₁₄				
Condensate extraction pump pH	a ₁₅				
	A ₁₅				
Chemistry index (%)					
Station index (%)					
<p>Additional details as required (attach supplementary pages as necessary):</p>					
Prepared by:		Date:			

20. Chemistry Compliance Index (non-GSS and GSS)

Purpose:

To indicate unit control of safety-related chemical and radiochemical parameters, in both non-guaranteed shutdown state (non-GSS) and in guaranteed shutdown state (GSS).

To monitor performance in meeting regulatory and licensee requirements in chemistry control.

To compare performance between Canadian CANDU units.

Definition:

The average percentage of time that the selected chemical parameters are in specification during the quarter.

Calculations:

Sampling frequencies and specifications shall be defined in the licensee's operating documentation. The method for calculation of the chemistry index also applies to this chemistry compliance index (non-GSS and GSS). The parameters are selected as compliance parameters in accordance with the safe operating envelope (SOE), and on the basis of safety.

Parameters monitored:

Non-GSS operating conditions:

Gadolinium ([Gd]) in liquid injection safety system poison injection tanks
 [Gd] in moderator (unit in poison outage, SDS2 actuated)
 moderator D₂O isotopic
 moderator H³
 moderator cover gas D₂
 moderator conductivity
 primary heat transport system D₂O isotopic
 primary heat transport system H³
 primary heat transport system I¹³¹
 primary heat transport system D₂O storage tank cover gas D₂
 moderator to primary heat transport system D₂O isotopic purity difference check
 annulus gas system dewpoint
 end shield cooling water pH
 end shield cooling cover gas H₂ (for Point Lepreau, Gentilly-2, Pickering 5-8)
 emergency coolant injection (ECI) system high-pressure water tank(s) pH
 ECI high-pressure water tank(s) hydrazine concentration
 liquid zone control system cover gas [H₂]
 liquid zone control system conductivity

GSS conditions:

liquid injection safety system poison injection tanks pH_a (when SDS2 is available)
 [Gd] in moderator
 moderator D₂O conductivity (except for Gentilly-2)
 moderator D₂O pH_a
 supplementary parameter(s) sampled

Notes:

The chemistry compliance indices (non-GSS and GSS) shall be reported as the percentage of time in specification. For each parameter, the index is calculated as follows:

$$\text{time in specification (\%)} = \frac{(\text{hours in specification})}{(\text{total operating hours in period})} \times 100$$

For further information, refer to notes 1 through 10 of the chemistry index.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Chemistry Compliance Index (non-GSS and GSS)					
NPP:					
Year:					
Quarter:					
Non-guaranteed shutdown state (non-GSS) operating conditions: a_i is the number of hours that parameter "i" is in specification during the quarter A is the number of hours the plant is in an operational state (non-GSS) (as defined by licensee-specific documentation) during the quarter					
Parameter		Unit (hours)			
		—	—	—	—
[Gd] in liquid injection safety system poison injection tanks	a_1				
	A_1				
[Gd] in moderator (unit in poison outage, SDS2 actuated)	a_2				
	A_2				
Moderator D ₂ O isotopic	a_3				
	A_3				
Moderator H ³	a_4				
	A_4				
Moderator cover gas D ₂	a_5				
	A_5				
Moderator conductivity	a_6				
	A_6				
Primary heat transport system D ₂ O isotopic	a_7				
	A_7				
Primary heat transport system H ³	a_8				
	A_8				
Primary heat transport system I ¹³¹	a_9				
	A_9				
Primary heat transport system D ₂ O storage tank cover gas D ₂	a_{10}				
	A_{10}				
Moderator to primary heat transport system D ₂ O isotopic purity difference check	a_{11}				
	A_{11}				
Annulus gas system dewpoint	a_{12}				
	A_{12}				
End shield cooling water pH	a_{13}				
	A_{13}				

continued on next page...

Parameter		Unit (hours)			
		—	—	—	—
End shield cooling cover gas H ₂ (for Point Lepreau, Gentilly-2, Pickering 5-8)	a ₁₄				
	A ₁₄				
ECI high-pressure water tank(s) pH	a ₁₅				
	A ₁₅				
ECI high-pressure water tank(s) hydrazine concentration	a ₁₆				
	A ₁₆				
Liquid zone control cover gas [H ₂]	a ₁₇				
	A ₁₇				
Liquid zone control conductivity	a ₁₈				
	A ₁₈				

Chemistry compliance index (non-GSS)

=

%

Guaranteed shutdown state (GSS) conditions:

For all units in guaranteed shutdown state (GSS) during the quarter, or part of the quarter:

b_i is the number of hours that parameter “i” is in specification during the quarter while the plant is in GSS

B is the number of hours the plant is in GSS (as defined by licensee-specific documentation) during the quarter

Parameter		Unit (hours)			
		—	—	—	—
Liquid injection safety system poison injection tanks pH _a (when SDS2 is available)	b ₁				
	B ₁				
[Gd] in moderator	b ₂				
	B ₂				
Moderator D ₂ O conductivity (except for Gentilly-2)	b ₃				
	B ₃				
Moderator D ₂ O pH _a	b ₄				
	B ₄				
Supplementary parameter(s) sampled	b ₅				
	B ₅				
	b ₆				
	B ₆				
	b ₇				
	B ₇				

Chemistry compliance index (GSS)

=

%

Station index (%)

=

%

Additional details as required (attach supplementary pages as necessary):
(differentiate between out-of-specification and missed samples where significant)

Prepared by:

Date:

21. Conventional Health and Safety

Purpose:

To indicate the accident severity rate, accident frequency and industrial safety accident rate at NPPs.

To monitor performance in meeting nuclear industry standards in the area of worker safety.

To compare Canadian NPP performance internationally.

Definition:

The accident severity rate is the total number of days lost or charged for all disabling injuries per 200,000 person hours worked at an NPP.

Accident frequency is the number of disabling injuries per 200,000 person hours worked at a NPP.

Industrial safety accident rate is a frequency rate based on the number of lost-time injuries for NPP personnel per 200,000 hours worked (excluding contractors).

The lost-time injury severity rate is the number of days lost multiplied by 200,000 person hours worked at an NPP, per exposure hours.

The all-injury frequency rate is the sum of the fatalities, lost-time injuries and medically-treated injuries, per exposure hours.

A lost-time injury is an injury or illness resulting in lost days beyond the date of injury as a direct result of an occupational injury or illness incident.

A medically treated injury (also referred to as "medical treatment") is an injury or illness beyond a first aid injury, where there have been no lost days that are the direct result of an occupational injury or illness incident.

A disabling injury is one that prevents an employee from reporting for work or from effectively performing all the duties connected with the employee's regular work.

Calculations:

$$\text{accident severity rate} = \frac{\# \text{ of lost days} * 200,000 \text{ person hours}}{\# \text{ of exposure hours}}$$

$$\text{accident frequency} = \frac{(\# \text{ fatalities} + \# \text{ lost time injuries} + \# \text{ medically treated injuries}) * 200,000 \text{ person hours}}{\# \text{ of exposure hours}}$$

$$\text{industrial safety accident rate} = \frac{\text{number of lost time injuries} * 200,000 \text{ person hours}}{\# \text{ of exposure hours}}$$

$$\text{lost time injury severity rate} = \frac{\text{number of days lost} \times 200,000 \text{ person hours}}{\text{\# of exposure hours}}$$

$$\text{all injury frequency rate} = \frac{\# \text{ fatalities} + \# \text{ lost time injuries} + \# \text{ medically treated injuries}}{\text{\# of exposure hours}}$$

Notes:

This safety performance indicator was renamed from “accident severity rate / accident frequency” for improved and expanded clarity and application.

An employee is any individual (including contractors and temporary staff) performing work at the NPP.

The Canadian federal reporting requirement for severity includes shifts not worked. For example, suppose a person is hurt on the last regularly scheduled shift and then is away for two days that were regularly scheduled off. If the person would not have been able to work those two days, but was able to return to work on the first regularly scheduled day, those two days would be counted as lost days.

Recurrent injuries are attributed back to the originating accident. For example, if an injury from an accident that resulted in a lost time injury occurred in 1994 and recurred in 1996 (with no new accident), the lost days would not appear in the 1996 totals. These days are attributed back to 1994.

Lost-time and medically treated injuries or illnesses are those that have been treated by a physician or other healthcare professional.

Permanent (partial) disability resulting from a disabling injury can be assigned equivalent lost days by the licensee. Appropriate information showing conversion data for each disabling injury must be submitted.

Whenever possible, the actual employee hours of exposure shall be taken from payroll or other records and shall include only actual straight time and actual overtime hours worked. Employee hours paid for but not worked (e.g., vacation, sickness, holidays, etc.) should not be included in the total hours worked. Estimated exposure hours should only be used when actual employee hours of exposure are not available. If estimating is required, it should be noted in the submission.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Conventional Health and Safety	
NPP:	
Year:	
Quarter:	
Number of fatalities	= _____
Number of lost-time injuries (LTIs)	= _____
Number of calendar days lost	= _____
Number of disabling injuries	= _____
Number of medically treated injuries	= _____
Exposure hours (total number of hours worked at NPP)	= _____
Industrial safety accident rate	= _____
Accident severity rate (per 200,000 hours worked)	= _____
Accident frequency (per 200,000 hours worked)	= _____
<p>Industrial safety accident rate = Number of lost-time injuries x 200,000 person hours / # of exposure hours</p> <p>Accident severity rate = # of calendar days lost x 200,000 person hours / # of exposure hours</p> <p>Accident frequency = (# of fatalities + # of lost time injuries + # of medically treated injuries) x 200,000 person hours / # of exposure hours</p>	
<p>Additional details as required:</p> <ul style="list-style-type: none"> • "Disabling injuries" are considered to be lost-time injuries + restricted work injuries • Fatalities, lost-time injuries and calendar days lost are included when work related and medically supported • Exposure hours (working) includes: 	
Prepared by:	Date:

22. Radiological Emergencies Performance Index

Purpose:

To provide a measurement of the performance of a nuclear power plant's emergency preparedness plan during radiological emergencies.

Definition:

The radiological emergencies performance (REP) index is the percentage of all the successful performance opportunities to the total number of performance opportunities identified during the previous eight quarters.

Calculations:

REP index =

$$\frac{(\text{number of successful performance opportunities during the previous 8 quarters})}{(\text{total \# of performance opportunities during the previous 8 quarters})} \times 100$$

Notes:

Performance opportunities are:

- categorizing a radiological emergency
- notifying offsite authorities
- providing decision making information to local authorities
- developing protective action recommendations

A performance opportunity is successful when both the timeliness and the accuracy criteria are fulfilled. The timeliness criteria and the accuracy criteria are specified in the licensee's emergency preparedness plan.

Details of any failed performance opportunity shall be included in the explanation of data section of the data sheet.

Emergencies, drills evaluated by the emergency response organization (ERO), exercises and other simulated emergencies that are assessed and that interact with one or more of the following facilities or functions shall be included in this indicator.

The ERO consists of the following facilities and functions:

- control room
- technical support group, technical advisory group, site management centre
- operations support group
- emergency operations facility
- emergency response teams
- field monitoring teams
- damage control teams
- joint information or local media centre
- offsite governmental authorities

Training practices shall not be included in this indicator.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Radiological Emergencies Performance Index								
NPP:								
Year:								
Quarter:								
<p>Submit the number of qualifying drills, exercises or events during the quarter.</p> <p>Detail the total number of performance opportunities, categorized by the timeliness and accuracy criteria.</p> <p>Indicate whether each performance opportunity was successful.</p>								
Radiological emergencies performance index	20## Q#	20## Q#	20## Q#	20## Q#	20## Q#	20## Q#	20## Q#	20## Q#
Number of successful performance objectives completed per quarter (Qa) =								
Number of performance objectives completed per quarter (Qb) =								
Number of successful performance opportunities during previous 8 quarters (sum Qa) =								
Total number of opportunities to perform categorizations and notifications during previous 8 quarters (sum Qb) =								
Percentage of opportunities to perform categorizations and notifications during previous 8 quarters (sum Qa/sum Qb) =								
Performance objectives					Timeliness			
Categorization a radiological emergency					Reasonable			
Notifying provincial contact categorization					15 minutes after			
Notifying municipal contact categorization					15 minutes after			
Notifying CNSC contact categorization					30 minutes after			
Providing decision making information to local authorities					120 minutes from time of categorization			
<p>Note: Drills, exercises or actual radiological emergency response events provide opportunities to complete performance objectives above. Successful completion of each is evaluated against defined timeliness and accuracy standards.</p>								
Additional details as required:								
Prepared by:					Date:			

23. Emergency Response Organization (ERO) drill participation index

Purpose:

To track the participation of emergency response organization (ERO) personnel in drills, exercises or events within a nuclear power plant.

Definition:

The percentage of the total available ERO personnel who have participated in proficiency-enhancing drills, exercises, practical evaluation opportunities or events during the previous eight quarters.

Calculations:

$$\text{ERO drill participation index} = \frac{A}{B} \times 100$$

where:

- A = number of ERO personnel fulfilling designated ERO positions that have participated in a qualifying drill, exercise, practical evaluation, or event during the previous 8 quarters
- B = total number of ERO personnel fulfilling designated ERO positions during the previous 8 quarters

Notes:

Designated ERO positions are those performing the following functions:

- categorization of event
- offsite notification
- plant operations
- corporate resources
- radiological monitoring
- dose projection

ERO personnel who have participated in more than one event during the last eight quarters shall be counted only for their most recent participation.

Changes in the number of designated ERO personnel shall be reflected in both the numerator and denominator of this index.

Multiple assignees to a given designated ERO position may each be counted for their individual participation in performing the designated ERO position at different times in the same proficiency-enhancing drill, exercise, practical evaluation opportunity or event during the previous eight quarters.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Emergency Response Organization (ERO) Drill Participation Index								
NPP:								
Year:								
Quarter:								
<p>For the previous 8 quarters, submit the number of designated ERO positions, frequencies of participation by ERO members in drills, exercises, or events, and the total number of designated ERO members.</p>								
ERO drill participation index	20## Q#	20## Q#	20## Q#	20## Q#	20## Q#	20## Q#	20## Q#	20## Q#
Total number of qualified key ERO personnel (A)								
Number of qualified key ERO personnel participating in drill/events during the quarter (B)								
Percentage of participating qualified key ERO personnel (B/A)*100								
Total number of qualified key ERO personnel participating in previous 8 quarters (sum B)								
Total number of qualified key ERO personnel in current quarter (sum A)								
Percentage of qualified key ERO personnel participating in a drill during previous 8 quarters ([sum B/sum A]*100)								
Additional details as required:								
Prepared by:					Date:			

24. Emergency Response Resources Completion Index

Purpose:

To indicate the level of verification of emergency response equipment and facilities dedicated to emergency preparedness at the NPPs.

Definition:

The percentage of preventive maintenance items, tests and checks completed for the emergency response equipment and facilities over the total number of preventive maintenance items, tests and inventory checks scheduled during the quarter.

Calculations:

$$\text{ER resources completion index} = \frac{A}{B} \times 100$$

where:

- A = the number of preventive maintenance items, tests and inventory checks completed during the quarter
- B = the number of preventive maintenance items, tests and inventory checks scheduled during the quarter

Notes:

Licensees shall provide the CNSC with a complete listing of preventive maintenance items, tests and inventory checks pertaining to dedicated equipment and facilities that are used for emergency preparedness, including:

- fixed systems
- portable instruments
- communications equipment
- other equipment identified in the licensee's emergency preparedness plan required to be in a state of readiness
- other dedicated emergency equipment and facilities identified in G-225, *Emergency Planning at Class I Nuclear Facilities and Uranium Mines and Mills* [9]

Pre-determined dates for the preventive maintenance items, tests and inventory checks shall be used to measure schedule compliance. This index measures the number of preventive maintenance items, tests and inventory checks performed and compares them with the pre-determined fixed schedule. It is not concerned with whether a test has failed or if equipment was missing.

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Emergency Response Resources Completion Index	
NPP:	
Year:	
Quarter:	
Submit a table identifying the number of preventive maintenance items completed and the number of preventive maintenance items scheduled during the quarter.	
Suggested addition:	
Number of preventive maintenance items, tests and checks completed	= _____
Number of items scheduled	= _____
Emergency response resources completion index (%)	= _____
Additional details as required:	
Prepared by:	Date:

25. Low- and Intermediate-Level Radioactive Solid Waste Generated

Purpose:

To indicate the amount of low- and intermediate-level radioactive solid waste generated.

Definitions:

Low-level radioactive solid waste contains material with radionuclide content above established clearance levels and exemption quantities, but generally has limited amounts of long-lived activity. The volume of waste generated is reported in m^3 for the quarter.

Intermediate-level radioactive solid waste typically exhibits levels of penetrating radiation sufficient to require shielding during handling and interim storage. The volume of waste generated is reported in m^3 for the quarter.

Calculations:

Data only.

Notes:

Detailed definitions for waste classifications are as per licensee procedures.

For further information on low- and intermediate-level radioactive waste, refer to CSA N292.3, *Management of low- and intermediate-level radioactive waste* [10].

Performance Indicator Data Sheet

Revision Date: yyyy-mm-dd

Title: Low- and Intermediate-Level Radioactive Solid Waste Generated	
NPP:	
Year:	
Quarter:	
Low-level radioactive solid waste generated (m^3) = _____	
Intermediate-level radioactive solid waste generated (m^3) = _____	
Additional details as required:	
Prepared by:	Date:

Appendix C: Content Requirements for the Annual Risk and Reliability Report

This appendix provides the requirements for the content of the annual risk and reliability report.

C.1 Summary

Provide a summary of major findings or major changes during the calendar year including:

1. changes in the list of systems important to safety (SIS) or their reliability targets
2. overall performance of SIS, including statistical summary of performance
3. changes having major impact on reliability models
4. major update of reliability or unavailability models for SIS
5. generic discussion on completion of required surveillance activities, including tests, predefines and operator routines
6. the number of initiating events
7. major changes in failure modes and/or failure rates

C.2 List of systems important to safety

Provide a list all identified SIS, and include the assigned reliability target for each system. Discuss and explain changes from previous years in the list of SIS or in the assigned reliability targets.

Guidance

This section may list structures and components important to safety and their reliability targets (if these structures and components have been identified).

Table C.1: List of systems important to safety and reliability targets

System important to safety	Reliability target

C.3 System performance

Include a section for each SIS, according to the format below.

C.3.1 Systems important to safety

Include a comparative assessment of the reliability and reliability target for each SIS of the NPP. Provide reliability information on relevant components important for mission reliability, including:

1. the predicted reliability of the system, where the predicted reliability is calculated using an up-to-date model and recent data
2. the observed reliability of the system during the previous year
3. a comparison between the predicted reliability, observed reliability and reliability target of the system
4. an explanation of changes in the predicted reliability of the system from the predicted reliability reported in previous years
5. specific reliability indices for major components such as class III power systems, and emergency or qualified power systems that include the failures to start (in failures per demand) and failures to run (in failures per hour) for each generator

C.3.1.1 Predicted reliability

In this section, the licensee reports the future reliability predicted using current data and compares it to the value obtained for the present and previous years, as well as to the target (see table C.2). The reliability assessment must be re-evaluated annually using the latest relevant failure data.

Guidance

This section should include information regarding the assessment such as computer code, model freeze date, cut-off value, electronic file name, revision information and the report number, where available. If this information is presented in the appendices, this section may refer to it. If the reliability assessment uses supporting data different from the data presented in section, the rationale should be described in this section.

Table C.2: Predicted reliability

Failure criteria	Predicted reliability			Target
	Previous years		Present year	
	Year X-2	Year X-1	Current (Year X)	

C.3.1.2 Observed reliability

This section is intended to capture the trends in the reliability of SIS.

Table C.3: Observed reliability of system

Failure criteria	Unit no. __	Unit no. __	Unit no. __	Unit no. __	Previous year predicted reliability	Target

Table C.4: Standby generator (SG) reliability indices**A. Test results (should provide the indices for both current year and previous year)**

SG#	Start		Running	
	Attempts	Failures	Hours	Failures
1				
2				
3				
4				
Total:				

B. Outage statistics

SG#	Maintenance		Forced	
	Occurrences	Hours	Occurrences	Hours
1				
2				
3				
4				
Total:				

Table C.4: Emergency power generator (EPG) reliability indices**A. Test results**

EPG#	Start		Running	
	Attempts	Failures	Hours	Failures
1				
2				
Total:				

B. Outage statistics

EPG#	Maintenance		Forced	
	Occurrences	Hours	Occurrences	Hours
1				
2				
Total:				

C.3.1.3 Incidents

For each SIS, identify and briefly describe occurrences during the calendar year where the system was unavailable to perform its function, and the dispositions for these incidents. If the occurrence was reported under an event report, then provide the event report number and a statement of the nature of the impairment.

This information is requested because the type of impairment may not correspond to the incident title.

This section describes incidents (also known as major impairments) of the systems and the effect on the system reliability. In relation to SIS, "incident" refers to any system fault reducing the effectiveness of the system such that it would fail to perform its safety function, even if the system would still operate.

Table C.6: Reliability of systems important to safety

Licensee event number	System affected	Component(s) affected	Level of impairment	Length of time system unavailable

C.3.1.4 Minor impairments

For each SIS, identify and briefly describe occurrences, during the calendar year, of minor impairments of the system. Describe the nature and duration of the impairment.

This section describes any minor impairment of the SIS and the assessment of the impairment on system reliability. In relation to SIS, a “minor impairment” refers to a fault that reduces the redundancy of the system or increases the possibility of a serious process failure or initiating event. In other words, it is a fault that causes degradation of a system but in which the system would still have met its design and performance specifications.

Guidance

Fault information for the nature of the impairment should be reported under section 4 of this annual risk and reliability report.

Scheduled removal of service of equipment that is reflected in the reliability model does not need to be described.

If the event also causes impairments of other SIS, these should be described in this section as a shared dependent event.

Table C.7: Minor impairment and effect on system reliability

Fault	Component / primary event	Failure mode	Failure duration

C.3.1.5 Changes

Describe changes for each SIS that occurred during the calendar year that affected reliability due to: (i) design, (ii) operating or maintenance practice and (iii) models used to assess reliability.

Report changes to design or operating and maintenance practice affecting the reliability of the systems; e.g., the duty cycle of equipment may affect the test frequency of the equipment.

Discuss changes to the model and the effect on the system's reliability.

C.3.1.6 Performance of surveillance activities

Provide the following information for systems important to safety:

1. a list of scheduled activities to inspect, monitor, test or verify the reliability of a system important to safety of the NPP, which were not completed on schedule during the calendar year
2. indication of the specific and cumulative impact on system reliability of the probabilistic safety assessment (PSA)-credited scheduled activities not being completed on schedule

Report any missed and postponed scheduled activities credited in reliability assessment. The reasons for missing or postponing the scheduled activities and the impact on the system reliability should be discussed. These activities include required tests, predefines (call-ups) and operator routines.

Additional information on the essential elements of a reliability program, including reliability assessment, modelling, evaluation and monitoring can be found in RD/GD-98, *Reliability Programs for Nuclear Power Plants* [11].

Guidance

For systems important to safety, the licensee may choose to use bounding evaluations for specific impact calculations. The cumulative impact of test deferrals needs to account for all test deferrals for the system over the year.

C.3.1.7 Correction of previous reports

Describe any corrections in previous reports. The correction may be a mistake or new findings over the reporting calendar year. The reason for the correction should be clearly provided.

Guidance

For example, when a design defect of a component is found over the calendar year and it has been dormant since the installation or modification of the component, the previous reliability indices should be modified. If a test reveals an impairment and the test period is long enough to affect the previous reliability indices, the previous reliability indices should also be reported.

C.4 Initiating events

Describe initiating events that occurred during the calendar year at the NPP, and provide the current frequency assigned to each initiating event. If the occurrence was reported under an event report, provide the event number.

Guidance

The frequency of the initiating event should be reassessed, and a comparison with the initiating event frequency used in the risk analysis should be provided if a plant PSA model is available. The description of the event should indicate if it affected the plant mitigating system's capability.

The analysis should include any equipment malfunction that occurred during the response to the initiating event. Any of these mitigating system failures should be clearly identified.

C.5 Supporting data

Provide data that supports the licensee's assessments during the calendar year of the reliability of the systems important to the safety of the NPP. Relevant data includes:

1. rates of failure of system components
2. significant trends in component failure rate data
3. input data regarding human error probabilities
4. changes to the list of PSA-credited scheduled activities to inspect, monitor, test or verify the system's reliability
5. data regarding the impairment (failure, incipient failure or degraded ability) of one or more system components as a direct result of a shared or common cause

Guidance

Data can be provided electronically. Licensees should provide the updated electronic reliability models for each system important to safety on a CD/DVD.

C.5.1 Component failure data

Include a section for each component failure, according to the format below.

C.5.1.1 Failure rates

This section describes major updates of the component failure rate data and the specific changes in failure rates from the failure rate database experienced over the calendar year.

Guidance

The failure database used for reliability model should be presented in the report appendices. This section should describe any significant failure rate change or significant trend. The definition of significant failure rate change or significant trend should be clearly described.

C.5.1.2 Failure modes

This section describes any failure mode that occurred during the calendar year and that is not modeled in the system fault trees, as well as its effect on system reliability.

C.5.2 Human error probability data

This section describes human actions that could affect the reliability of SIS.

Guidance

Some human actions that directly affect the reliability of the SIS may be included other sections, but a comparison to the human errors considered in the reliability model should be performed.

C.5.3 Dependent failures

Include a section for each dependent failure, according to the format below.

C.5.3.1 Shared cause

This section describes events that result in inter-system shared dependent impairments, which cause multiple components that belong to different systems to be unavailable and that can be explicitly included in the reliability models.

Guidance

For example, a failure of an instrument air manifold that supplies air to multiple components in more than one independent system would result in an inter-system shared-cause dependent failure and should be reported in this section.

Intra-system dependent impairments that affect one system only are described in the section of an individual system. For example, if the manifold supplies air to multiple components, but in only one system, the failure would be identified as an intra-system shared-cause dependent failure and might be described in the section of individual system.

C.5.3.2 Common cause

This section describes events that may result in inter/intra-system dependent failure or degradation, but for which the reliability model cannot explicitly include the cause of failure.

Guidance

Even though the report contains human-induced common-cause failures, this section should identify these events as common-cause failures.

C.5.4 List of scheduled maintenance and surveillance activities**Guidance**

The changes to the list of PSA-credited scheduled activities to inspect, monitor, test or verify the system's reliability should be included here or in an appendix. Changes should be reported in a manner that can be related to a list of activities that can be referenced.

C.5.5 Other plant-specific data**Guidance**

This section includes other plant-specific data important to the reliability program not included above. The reliability statistics of special equipment should be included here.

C.6 Report appendices

Include an appendix for each reference section, according to the format below.

C.6.1 Appendix A – List of acronyms and abbreviations

In this appendix, provide acronyms and abbreviations used in the report.

C.6.2 Appendix B – Definitions

In this appendix, provide definitions for technical or licensee terms used in this report.

C.6.3 Appendix C – Component failure data

See section C.5.1 for details regarding the information to be placed in this appendix. Component failure data can be provided electronically.

C.6.4 Appendix D – Fault records

Provide details regarding fault records.

C.6.5 Appendix E – Test program summary

This appendix lists the scheduled activities included in the reliability models and describes the changes that are not included in the individual system sections, including routine tests, predefines (scheduled plant activities), operator routines and main control room panel checks.

C.6.6 Appendix F – Models of the systems important to safety

The information presented in this appendix may vary according to the reliability program being implemented by individual NPPs (e.g., one plant may apply a single cut-off to all systems, while another plant may apply different cut-off values to the systems). The following example therefore defines content, not format.

Table C.8: Reliability model information

System	Reliability model				Report	
	File name	Cut-off	Revision	Date	Report #	Date
Computer code*	CAFTA Version XX (month year)			CAFTA Cutset Generator Version YY (month year)		

* Common to all system models

Glossary

action level

A specific dose of radiation or other parameter that, if reached, may indicate a loss of control of part of a licensee's radiation protection program, and triggers a requirement for specific action to be taken.

barrier

A physical obstruction that prevents or inhibits the movement of people, radionuclides or some other phenomenon (e.g., fire), or provides shielding against radiation.

calendar year

A period of 12 consecutive months beginning on January 1.

counterfeit item

An item that is intentionally manufactured or altered to imitate a product without the legal right to do so.

date of filing (of a report)

The date on which it is received by the Commission.

defined specifications

The criteria, as set out in a nuclear power plant's version-controlled documents or licensee documents requiring notification of change, which specify the capability or performance level that a structure, system, or component of the NPP must possess or attain so that the NPP can function effectively and reliably, in accordance with its safety targets.

design basis earthquake (DBE)

As defined in the CSA Group publication CSA-N289.1-08, *General requirements for seismic design and qualification of CANDU nuclear power plants* [12], which is referenced in the nuclear power plant licence, "an engineering representation of potentially severe effects at the site due to earthquake ground motions having a selected probability of exceedance of 1×10^{-4} per year, or such probability level as determined by the regulatory authority.

"Notes:

- "DBE ground motions are usually referred to as an "earthquake", and can take the form of a response spectrum, or time history of acceleration, velocity, or displacement.
- "The DBE is used for the seismic qualification of certain structures, systems, and components. It is used as an input for nuclear power plant seismic design, analysis, and testing to produce a design that is adequate for the specified seismic hazard.
- "The DBE for some older plants was based on an estimated probability of exceedance of 1×10^{-3} per year or was established deterministically (i.e., without probabilistic measures)."

environment

Means the components of the Earth and includes:

- air, land and water
- all layers of the atmosphere
- all organic and inorganic matter and living organisms
- the interacting natural systems that include components referred to above

event

Any occurrence unintended by the licensee, including operating error, equipment failure or another mishap, and deliberate action on the part of others, the consequences or potential consequences of which are not negligible from the point of view of protection or safety.

exposure hours

The total number of hours of employment of all employees for each member utility for each reporting period. Note: employees include regular hires and direct contractors / augmented / supplemented staff. Contractors working through a separate company are not counted.

external event

Any event that proceeds from the environment external to a nuclear power plant and can cause a plant's structures, systems or components to fail. External events include, but are not limited to, earthquakes, floods and hurricanes.

failure

The inability or interruption of ability of a structure, system or component to function within acceptance criteria.

fatality

Any death resulting from an injury or illness regardless of time intervening between injury or illness and death. Fatalities will be reported but no days will be charged to the event.

fault

A synonym of failure.

fire

A process of combustion characterized by heat emission and accompanied by smoke or flame, or both.

flooding

Liquid present in an area in a quantity exceeding what would normally be expected and that has an impact on the safe operation of the nuclear power plant.

fraudulent item

An item whose material, performance or characteristics are knowingly misrepresented with intent to deceive. Include items provided with incorrect identification, or falsified or inaccurate certification. Also includes manufacturing overages sold by entities with the legal right to manufacture a specified quantity of an item but that produce a larger quantity than authorized, which is then sold as legitimate inventory.

guaranteed shutdown state (GSS)

The reactor shall be considered to be in a guaranteed shutdown state if there is sufficient negative reactivity to ensure subcriticality in the event of any process failure, and approved administrative safeguards (i.e., reactor shutdown guarantees), approved by the senior operations authority and concurred with by the CNSC, are in place to prevent net removal of negative reactivity.

impairment

A failure such that the safety-related system would operate with reduced redundancy or margin of safety, or would fail to meet its design intent. Level 1 impairment describes a system state that is impaired to the extent that it would provide inadequate protection; level 2 impairment describes a system state that is impaired to the extent that it would provide some, but not complete, protection for a worst-case process

failure. Level 3 impairment is used to describe a system state where the level of redundancy or margin of safety is reduced but the system is still fully capable of meeting its design intent.

initiating event

An event that initiates a sequence of events that could lead to a severe accident in the absence of action by a system important to safety, or an event involving a system important to safety that initiates a sequence of events that could have led to a severe accident if other systems important to safety had not acted.

initiating parameter

The physical property being measured or monitored by the triggering device for a special safety system or its subsystems.

licensee documents requiring notification of change

Licensee documents for which the licensee is required to notify the CNSC, in writing, when changes are made; typically identified in the licence conditions handbook (LCH).

licensing basis

A set of requirements and documents for a regulated facility or activity comprising:

- the regulatory requirements set out in the applicable laws and regulations
- the conditions and safety and control measures described in the facility's or activity's licence and the documents directly referenced in that licence
- the safety and control measures described in the licence application and the documents needed to support that licence application

lost days

The number of calendar days that the employee is unable to work beyond the day of injury or illness recommended by a physician or other health care professional. Lost time ends as of the date that the employee is deemed fit to work either full or restricted work or to a maximum of 180 calendar days for any individual case.

lost-time injury

An injury or illness resulting in lost days beyond the date of injury as a direct result of an occupational injury or illness incident.

medically treated injury

An injury or illness beyond a first aid injury, where there have been no lost days that are the direct result of an occupational injury or illness incident.

nuclear power plant

A nuclear facility consisting of any fission-reactor installation that has been constructed to generate electricity on a commercial scale. An NPP is a Class 1A nuclear facility, as defined in the *Class 1 Nuclear Facility Regulations*. Where a licence is issued for multiple reactors, NPP means all the reactors identified in the licence.

planned work

Major safety-significant work scheduled in the outage, which, in the licensee's judgement, is of regulatory interest but is not mandatory or committed, including:

- repair or maintenance tasks to correct known problems (e.g., level 3 impairments)
- inspection tasks (e.g., periodic inspection program (PIP) inspections) that must be completed over a multi-year cycle and for which there is another planned maintenance outage before the end of the current cycle
- requests from CNSC staff to do additional inspections beyond the PIP requirements
- additions to outage scope, such as component repairs or replacement, resulting from conducting a planned inspection during the outage

pressure boundary

A boundary of a pressure-retaining vessel, structure, system or component of a nuclear or non-nuclear system.

pressure boundary degradation

A degradation of a pressure boundary that exceeds any relevant limit specified in the applicable design analysis, design codes or standards, or inspection codes or standards.

programmatic failure

Also referred to as a programmatic non-compliance; exists when one or both of the following circumstances occurs:

- failure to establish or comply with a required program or program element as credited in the licensing basis
- aggravated or systemic failure(s) to adhere to applicable procedures

Note: Individual non-compliances with licensee-produced documents that have no immediate or short-term regulatory or safety consequences and that are not indicative of programmatic failures shall not be considered safety-significant situations or events.

regulatory undertaking

Outage work required by a code or a standard that is referenced in the licence (mandatory work) or work that was committed by the licensee to the CNSC through formal correspondence (committed work) including:

- periodic inspection program (PIP) inspections in the last outage of a PIP cycle
- PIP work that is required to allow the extension of an existing disposition that will expire before the next planned outage

reliability

The ability of a structure, system or component to perform, in accordance with its defined specifications, its required function under given conditions for a defined time period or upon demand.

risk

The chance of injury or loss, defined as a measure of the probability and severity of an adverse effect (consequences) to health, property, the environment or other things of value; mathematically, it is the probability of occurrence (likelihood) of an event multiplied by its magnitude (severity).

safe operating envelope (SOE)

The set of limits and conditions within which the nuclear power plant must be operated to ensure compliance with the safety analysis upon which the reactor operation is licensed and that can be monitored by or on behalf of the operator and can be controlled by the operator.

safety analysis

Analysis by means of appropriate analytical tools that establishes and confirms the design basis for the items important to safety; and ensures that the overall plant design is capable of meeting the acceptance criteria for each plant state.

safety performance indicator

Data that is sensitive to and/or signals changes in the safety performance of systems or programs that maintain the licensing basis of an NPP.

safety-related system

As defined in the CSA Group publication CSA-N285.0-08, *General requirements for pressure-retaining systems and components in CANDU nuclear power plants* [13], which is referenced in the nuclear power plant licence, "those systems and their related components and supports that, by failing to perform in accordance with the design intent, have the potential to impact the radiological safety of the public or nuclear power plant personnel. Those systems and their components involve

- "the regulation (including controlled startup and shutdown) and cooling of the reactor core under normal conditions (including all normal operating and shutdown conditions)
- "the regulation, shutdown and cooling of the reactor core under anticipated transient conditions and accident conditions, and the maintenance of the reactor core in a safe shutdown state for an extended period following such conditions
- "limiting the release of radioactive material and the exposure of plant personnel and/or the public to meet the criteria established by the licensing authority with respect to radiation exposure during and following normal, anticipated transient conditions and accident conditions

"Notes:

- "The term "safety-related system" covers a broad range of systems, from those having very important safety functions to those with a less direct effect on safety. The larger the potential radiological safety effect due to system failure, the stronger the 'safety-related' connotation.
- "'Safety-related' also applies to certain activities associated with the design, manufacture, construction, commissioning, and operation of safety-related systems and to other activities that can similarly affect the radiological safety of the public or plant personnel, such as environmental and effluent monitoring, radiation protection and dosimetry, and radioactive material handling (including waste management). The larger the potential radiological safety effect associated with the performance of the activity, the stronger the 'safety-related' connotation.
- "Certain failures of other systems can adversely affect a safety-related system (e.g., through flooding or mechanical damage)."

safety significance

The significance of a situation, event or issue with respect to the impact on meeting the nuclear safety objectives as defined by the International Atomic Energy Agency (IAEA) in document SF-1 *Fundamental Safety Principles* [14]. In general, a situation, event or issue has safety significance if it denotes a deviation from the safety case accepted in the licence, in a direction detrimental to safety, such as but not limited to:

- reducing margins to (or exceeding) the accepted limits
- increasing risk to the health, safety and security of persons and the environment
- impairments (various degrees) of the special safety systems or of the safety functions for accident mitigation
- reduction in defence in depth
- events causing radioactive releases and spills of hazardous substances, injuries to workers or the public, etc.

serious illness or injury

Injury or illness incurred, or possibly incurred, as a result of the operation of the nuclear power plant, including an injury of a serious nature from any cause in the workplace that:

- requires hospitalization
- places life in jeopardy
- produces unconsciousness
- results in substantial loss of blood
- involves the fracture of a leg or arm, but not a finger or toe
- involves the amputation of a leg, arm, hand, or foot, but not a finger or toe
- consists of burns to a major portion of the body
- causes the loss of sight in an eye
- causes paralysis
- causes permanent hearing impairment

Note: "Possibly incurred" refers to the cause of the injury and not the potential for injury.

serious process failure

A failure of a process structure, system or component that leads to a systematic fuel failure or a significant release from the nuclear power plant, or that could lead to a systematic fuel failure or a significant release in the absence of action by any special safety system.

significant release

A release of radioactive material that results in an effective dose, received by or committed to a typical member of the critical group, in excess of 0.5 mSv (50 mrem).

situation

Conditions, circumstances or configurations that occur, are discovered or that may lead to an event.

special safety system

One of the following systems of an NPP: shutdown system no. 1, shutdown system no. 2, the containment system or the emergency core cooling system.

standby safety-related system

As specified by the licensee, those poised systems that provide for the ultimate reactor cooling following design basis events (e.g., emergency power supply and emergency water supply).

structures, systems and components (SSC)

A general term encompassing all of the elements (items) of a facility or activity that contribute to protection and safety. Structures are the passive elements: buildings, vessels, shielding, etc. A system comprises several components, assembled in such a way as to perform a specific (active) function. A component is a discrete element of a system. Examples are wires, transistors, integrated circuits, motors, relays, solenoids, pipes, fittings, pumps, tanks, and valves.

substandard item

An item that does not meet the intended product specification. It is possible for legitimate suppliers to unknowingly provide substandard items that were manufactured using raw materials or part-level items that were acquired from sub-tier suppliers and that – for some reason – did not meet the applicable specifications.

suspect item

An item that is suspected to be counterfeit, fraudulent or substandard.

systematic fuel failure

Fuel that has no defect prior to an event, fails or exceeds the fuel integrity criteria defined in the version-controlled document or the licensee documents requiring notification of change as a result of the event.

systems important to safety (SIS)

As defined in RD/GD-98, *Reliability Programs for Nuclear Power Plants* [11], structures, systems and components (SSCs) of the nuclear power plant associated with the initiation, prevention, detection or mitigation of any failure sequence and that have the most significant impact in reducing the possibility of damage to fuel, associated release of radionuclides, or both.

version-controlled document

A document that is subject to version control due to its inclusion in the licence conditions handbook. Includes regulatory/industry standards as referenced in the licence (may include regulatory/industry standards that require transition) and may include key licensee documents, such as documents requiring consent of change (as per a licence condition).

References

1. Canadian Nuclear Safety Commission (CNSC), REGDOC-2.4.1, *Safety Analysis: Deterministic Safety Analysis*, Ottawa, Canada, 2014.
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4. CNSC, G-274, *Security Programs for Category I or II Nuclear Material or Certain Nuclear Facilities*, Ottawa, Canada, 2003.
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6. CNSC, G-219, *Decommissioning Planning for Licensed Activities*, Ottawa, Canada, 2000.
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8. ASME, *Boiler & Pressure Vessel Code*, 2013 edition
<https://www.asme.org/shop/standards/new-releases/boiler-pressure-vessel-code-2013>
9. CNSC, G-225, *Emergency Planning at Class I Nuclear Facilities and Uranium Mines and Mills*, Ottawa, Canada, 2001.
10. CSA Group, N292.3-08, *Management of Low- and Intermediate-Level Radioactive Waste*, 2008 (reaffirmed 2013).
11. CNSC, RD/GD-98, *Reliability Programs for Nuclear Power Plants*, Ottawa, Canada, 2012.
12. CSA Group, CSA-N289.1-08, *General requirements for seismic design and qualification of CANDU nuclear power plants*, Canada, published in 2008, reaffirmed in 2013.
13. CSA Group, CSA-N285.0-08, *General requirements for pressure-retaining systems and components in CANDU nuclear power plants*, Canada, 2008.
14. International Atomic Energy Agency (IAEA), *Safety Standards Series SF-1 Fundamental Safety Principles*, 2006.

CNSC Regulatory Document Series

Facilities and activities within the nuclear sector in Canada are regulated by the Canadian Nuclear Safety Commission (CNSC). In addition to the *Nuclear Safety and Control Act* and associated regulations, these facilities and activities may also be required to comply with other regulatory instruments such as regulatory documents or standards.

Effective April 2013, the CNSC's catalogue of existing and planned regulatory documents has been organized under three key categories and twenty-five series, as set out below. Regulatory documents produced by the CNSC fall under one of the following series:

1.0 Regulated facilities and activities

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| Series | 1.1 | Reactor facilities |
| | 1.2 | Class IB facilities |
| | 1.3 | Uranium mines and mills |
| | 1.4 | Class II facilities |
| | 1.5 | Certification of prescribed equipment |
| | 1.6 | Nuclear substances and radiation devices |

2.0 Safety and control areas

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|--------|------|--|
| Series | 2.1 | Management system |
| | 2.2 | Human performance management |
| | 2.3 | Operating performance |
| | 2.4 | Safety analysis |
| | 2.5 | Physical design |
| | 2.6 | Fitness for service |
| | 2.7 | Radiation protection |
| | 2.8 | Conventional health and safety |
| | 2.9 | Environmental protection |
| | 2.10 | Emergency management and fire protection |
| | 2.11 | Waste management |
| | 2.12 | Security |
| | 2.13 | Safeguards and non-proliferation |
| | 2.14 | Packaging and transport |

3.0 Other regulatory areas

- | | | |
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| Series | 3.1 | Reporting requirements |
| | 3.2 | Public and Aboriginal engagement |
| | 3.3 | Financial guarantees |
| | 3.4 | Commission proceedings |
| | 3.5 | Information dissemination |

Note: The regulatory document series may be adjusted periodically by the CNSC. Each regulatory document series listed above may contain multiple regulatory documents. For the latest list of regulatory documents, visit the CNSC's website at nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents